SILSBEE INDEPENDENT SCHOOL DISTRICT

SILSBEE HS WELDING SHOP FINISH-OUT

1575 Hwy 96 N
Silsbee, Texas 77627

Project Manual

Issued for Job Order Contract Proposal
March 17, 2022

AAI Project Number 21051 **Set No._____**

MEP Engineers	*Civil Engineers*	*Structural Engineers*	*Architects*
M&E CONSULTING	Fittz&Shipman INC. Consulting Engineers and Land Surveyors	Fittz&Shipman INC. Consulting Engineers and Land Surveyors	AAI Architectural Alliance,Inc.

350 Pine Street, Suite 720 Beaumont, Texas 77701 409.866.7196 www.architectall.com

PROJECT MANUAL

SILSBEE HIGH SCHOOL WELDING SHOP FINISH-OUT
Silsbee Independent School District
1575 Hwy 96 N, Silsbee, Texas 77656

Owner
SILSBEE INDEPENDENT SCHOOL DISTRICT
Gregg Weiss, Superintendent

Architect
ARCHITECTURAL ALLIANCE, INC.
350 Pine Street, Suite 720
Beaumont, TX 77701
Project Architect: Rob Clark, AIA
rclark@architect-aia.com
(409) 866-7196
(409) 866-1745 fax

Civil Engineer / Structural Engineer
FITTZ & SHIPMAN, INC.
1405 Cornerstone Court
Beaumont, TX 77706
Structural Project Engineer: Daniel Dotson, PE
Civil Project Engineer: Ben Tristan, PE
(409) 832-7238
(409) 832-7303 fax

Mechanical, Electrical and Plumbing Engineer
M & E CONSULTING
1304 Bertrand Drive, Suite F7
Lafayette, LA 70706
Project MEP Engineer: Hogan Guidry, PE
(337) 234-7474 x103
(337) 234-7774 fax

AAI Project Number: 21051
March 17, 2022

SILSBEE HIGH SCHOOL WELDING SHOP FINISH-OUT

SILSBEE INDEPENDENT SCHOOL DISTRICT

1575 HWY 96 N SILSBEE,TX 77656

3/17/2022

PROJECT NAME: Silsbee High School Welding Shop Finish-Out

ARCHITECT: Architectural Alliance Inc

PROJECT NO: 21187.090

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INSTRUCTION TO BIDDERS

1. Identify the envelope containing the **Job Order-Order Proposal** in compliance with Texas Education and Region V Standards and Requirements.

2. The Architect reserves the right to issue Addenda at any time prior to proposal openings. All such Addenda become, upon issuance, an inseparable part of the contract documents. Each offeror shall cover such addenda in his bid and acknowledge receipt of same on the blank provided on the contractors bid form.

9. In accordance with Article 5159a, Revised Civil Statutes of Texas, all contractors and subcontractors must pay no less than the prevailing wage rate as is presently in use in the Jasper County, Texas area. It is the responsibility and the expense of the general contractor to assure and document that subcontractors comply with the applicable prevailing wage decision for all workers.

11. Sales Tax: Materials and equipment incorporated into this project are exempt in accordance with Article 20.01 (T) of the Texas Limited Sales Tax Law) from the state sales tax, provided: The Contract is drawn segregating the cost of overhead, profit and other cost of the contract; the contractor procures a Limited Sales Tax Permit from the Comptroller of Public Accounts; the Owner issues an Exemption Certificate to the Contractor for the projects; and the Contractor delivers a Resale Certificate to his supplier in lieu of paying the state sales tax for each item purchased for incorporation into this project. This project is also exempt from City of Beaumont sales tax. Subcontractors may follow this same procedure in purchasing materials or equipment which are to be incorporated into the construction. Tools, scaffolding, form lumber, fuel and all other items relating to but not actually a part of the construction are not exempt from the state sales tax. The Owner will issue an exemption certificate for this project but will accept no responsibility for the proper performance by the Contractor or his subcontractors of the procedure necessary to insure exemption of payment of tax.

12. Performance and Payment Bond: The successful offeror must furnish a performance bond and payment bond by a corporate security company acceptable to Owner and authorized to do business in Texas in the amount of 100% of the total contract before starting the work if the contract is in the total amount of $25,000 or greater. Additional Guidelines for contract Bonds: The contractor shall furnish performance and Payment bonds to guarantee successful completion of the project. Such bonds are required for all contracts, except for contracts less than $25,000.

13. The Performance and Payment bonds (statutory bonds for public work) included herein shall be executed and submitted in duplicate to the Owner/Architect before commencement of the work.

14. Each of the two bonds shall be issued in an amount equal to 100% of the total contract price.

15. The bonds shall be executed by a surety company that is (a) acceptable to the Owner, (b) licensed in Texas, and (c) listed in the Department of the Treasury circular No. 570 and qualified therein to provide a bond in the amount required.

16. The surety company shall be represented by a licensed bonding agent with a permanent office in Texas.

17. The bonds shall be signed by the principal and by an authorized agent of the surety company and must be accompanied by a certified copy of the agent's authority to act.

18. The bonds shall not be dated before the contract date and shall note in the district of Hardin County, Texas.

19. The Contractor shall provide a full-time qualified superintendent over all crafts and who shall have the authority to make decisions regarding any and all phases of work.

20. During the course of construction, the contractor shall provide all normal and necessary equipment and facilities required for his own use.

21. Guarantee: The Contractor shall furnish to the Owner an unconditional written guarantee on all phases of the work including materials, labor, and all other things for one (1) year from date of completion and acceptance by the Owner and other warranties and insurance policies described in these construction documents.

22. Violation of Anti-Trust Laws: "Vendor hereby assigns to the purchaser any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. SEC. 1 et seq. (1973)"

23. Periodical Payments for General Contract: The Contractor Agreement between the Owner and contractor will provide for payment of 95% of costs of the labor performed, materials suitably stored at the site, and materials built into the work as of the last day of the month. (5% Retainage)

24. Prevailing Wage Rates: Contractors must pay close attention to the Davis Bacon Act and attached current wage rates decision included in these specifications.

END OF INSTRUCTIONS

SECTION 01 00 00 – GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED:
- A. Title of Work, and type of Contract.
- B. Work sequence.
- C. Contractor use of premises.
- D. Coordination.
- E. Project meetings.
- F. Owner-furnished products.
- G. Job report.

1.2 WORK COVERED BY CONTRACT DOCUMENTS
- A. Work in this contract comprises site clearing, excavation, concrete foundation, site paving, masonry, steel structure, metal wall panels , insulation, vinyl back insulation, interior finish wall panels, gutters and downspouts, steel doors and frames, power and lighting, modifications as required to HVAC, welding variable pressure exhaust system including controls and ducting and louvers, moving existing welding stations to new location as the project moves forward and coordinating work around student occupied building.

1.3 CONTRACT METHOD
- A. Stipulated Sum Owner/Contractor Agreement.

1.4 WORK SEQUENCE
- A. All work will be awarded, plus any accepted alternates, to the lowest qualified general contractor.
- B. All work will be performed in a safe manner with the general contractor responsible to maintain a safe perimeter fence around the area of construction plus barriers and warning devices to prevent the general public from wondering onto the site.
- C. Contractor will present an updated schedule with each application for payment and documented rain day extensions at each monthly meeting for review by architect, owner's representative and owner's facility maintenance supervisors. Contractor may only pick-up the current month's rain day extensions. Picking up past month rain day extensions will not be permitted.
- D. Contractor is reminded of liquidated damages for this project if not completed within the contract period plus approved rain days.

1.5 CONTRACTOR USE OF PREMISES
- A. Assume full responsibility for the protection and safekeeping of products under this contract, stored on and off the site.

1.6 COORDINATION
- A. Coordinate work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Verify that characteristics of elements of interrelated operating equipment are compatible; coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.7 PROJECT MEETINGS

A. Monthly meeting date will be established as part of the contract agreement to be attended by the contractor project superintendent, project manager and personnel having necessary knowledge of the project; Owner's representatives and building maintenance personnel; subcontractors and suppliers when necessary to provide information regarding project materials, methods and issues; architect and personnel; engineering consultants with information regarding specific issues or scope; and other persons needed to assist in keeping the project moving forward, without delay.

1.8 OWNER-FURNISHED PRODUCTS

A. Certain products will be furnished and paid for by the Owner, where so described in the Specifications and/or the Drawings.
B. For those products designated as Owner Furnished/Contractor Installed, Contract responsibilities are to be as outlined below.
C. Owner's Responsibilities:
    1. Provide necessary utilities rough-in drawings, shop drawings, product data and samples to the Contractor.
    2. Arrange and pay for product delivery to the site, in accordance with the construction schedule.
    3. Submit claims for transportation damage.
    4. Arrange for replacement of damaged, defective or missing items.
    5. Arrange for manufacturer's warranties, service, and inspections, as required.

D. Contractor's Responsibilities:
    1. Designate delivery dates of equipment to coincide with Construction Schedule.
    2. Review utilities rough-in drawings, shop drawings, product data and samples.
        (a) Submit to Architect with notification of any discrepancies or problems anticipated in utility rough-in locations or the use of products.
    3. Receive item at site or at another location as designated by Contractor and give written receipt for item at time of delivery and notify Owner, in writing, within 15 days of delivery listing all items received, noting visible defects or omissions; if such declaration is not given, Contractor shall assume responsibility for such defects and omissions.
    4. Handle products at the site, including uncrating and storage.
    5. Protect products from exposure to elements, from damage.
    6. Store item until ready for installation. Owner will not provide space for storage.
    7. Install items in conformance with manufacturer's recommendations, instructions, and shop drawings under supervision of manufacturer's representative when appropriate, supplying labor and material required and making mechanical, plumbing and electrical connection necessary to operate equipment.
    8. Repair or replace items damaged by Contractor.
    9. Provide Owner with copy of supplier bill of materials and all other receiving documentation.
    10. Dispose of equipment crates, cartons, packing materials and other debris resulting from unpacking Owner's equipment.

1.9 JOB REPORTS:

A. Submit, in two copies, each week to the Architect a summary of the contractor's work prepared by the construction Superintendent.
B. These information summaries will not relieve the contractor of the responsibility for giving any specific notification or report required by the specifications.

END OF SECTION

SECTION 01 10 00 - SUMMARY

RELATED DOCUMENTS
Drawings and general provisions of the Contract, including General Conditions, Supplementary General Conditions, Special Provisions, and other Division 1 Project Manual Sections, apply to work of this Section.

THE PROJECT

Name of Project:	Silsbee High School Welding Shop Finish-Out
Location of Site:	1575 Hwy 96 N Silsbee, Texas 77656
Owner:	Silsbee Independent School District
Architect:	Architectural Alliance, Inc. 350 Pine Street Suite 720 Beaumont, Texas 77701
Civil/Structural Engineer:	Fittz & Shipman, Inc. 1405 Cornerstone Ct. Beaumont, Texas 77706
Mechanical/Electrical/Plumbing Engineer:	M & E Consulting 1304 Bertrand Drive Suite F7 Lafayette, Louisiana 70706

All work under this project will be coordinated with the owner, architects, the general contractor, and sub-contractors. These individuals will be identified at the pre-construction meeting. All rerouting of underground water, sewer, drainage, telephone, communications, etc. will be reviewed. This work effecting disruption of services (telephone, electrical, etc.) will be accomplished so as to create as little inconvenience as possible.

The successful contractor will submit his proposed sequence of operations to the Owner/Architect for review and acceptance before the authorization to proceed is issued.

Prior to submitting proposal, visit site and become familiar with conditions under which work on this Contract will have to be performed.

No allowance will be made on behalf of the Contractor for any error or negligence on his part, for by his submission of his proposal, the bidder represents that he is familiar with the conditions of the site.

CONTRACT LIMITS
Confine operations of this Contract to the immediate area shown on site plan. Confine operations of this Contract to the immediate area around the building site. Contractor must provide 6’ temporary chain link security fence around entire construction site including lay-down area and with secured gates and security lighting throughout sequence of construction. Provide “warning construction site” and “restricted entry” signs to warm the general public.

SCHEDULE OF WORK
It is necessary that the general contractor coordinate access to the site and agree to certain restrictions to permit traffic along the adjacent roadway to run without any disturbance from construction process.

CONTRACT FORMS
The Contract will be executed on American Institute of Architects Standard construction contract form. Copies of the form may be found in this project manual.

PERMITS, FEES, TAXES
All proposals submitted by the various contractors and/or sub-contractors shall include all permits, fees, taxes and like expenses necessary for the construction and completion of work.

STATE SALES TAX
The Owner qualified for exemption from State and Local Sales Tax pursuant to the provisions of Article 20.04 (F) of the Texas Limited Sales, Excise and Use Tax Act.

The Contractor performing this Contact may purchase, rent, or lease all materials, supplies, equipment used or consumed in the performance of this Contract by issuing to his suppliers an exemption certificate in lieu of the tax, said exemption certificate complying with State Comptroller of Public Accounts Ruling No. 95-0.07. Any such exemption certificate issued by the Contractor in lieu of the tax shall be subject to the provisions of the State Comptroller of Public Accounts ruling No. 95-0.09 as amended.

BONDS
The Contractor will be required to furnish a Performance Bond and a Payment Bond in the amount of not less than one hundred percent (100%) of the Contract Sum including all authorized extras, conditioned upon the faithful performance of the Contract and upon payment of all persons supplying equipment, materials and/or labor as a portion of the Contract Documents.

The following Rules will be strictly adhered to by all workmen of Contractors, Sub-Contractor and Supplier performing work on this campus.

- Possession, use or transfer of drugs is prohibited on site.
- Possession of firearms and/or other weapons is prohibited within the building and must be secured if located in work vehicles.
- Tobacco products and alcohol is prohibited on site including use of chewing tobacco.
- Construction personnel and subcontractors are restricted from on-going conversations or contact with any students on campus during this construction.
- Loud language, cursing or inappropriate “cat calls” within hearing range of bystanders will not be tolerated and will be reason to ask the project superintendent to restrict worker access to site.

PREVAILING WAGE RATES
Attention is called to the fact that bidders must comply with State Labor Laws as required by Articles 1579, 1580, 1581 and 1581A of Vernon’s Penal Code and Article 5159A of Vernon’s Civil Code. Contractor is required to pay, as a minimum, the prevailing wage scales of the various classes of labor upon this work. The most current applicable wage decision is attached with this document.

CLAIMS FOR UNPAID LABOR AND MATERIALS
When the value of the Contract (between the Owner and the Contractor) is in excess of $25,000.00, claims must be sent direct to the Contractor and his surety in accordance with Article 5160 V.T.C.S. The Owner will furnish, in accordance with such Article, a copy of the Payment Bond as provided therein to claimants upon their request. ALL CLAIMANTS ARE CAUTIONED THAT NO LIEN EXISTS ON THE FUNDS UNPAID TO THE CONTRACTOR ON SUCH CONTRACTS, AND THAT RELIANCE ON NOTICES SENT TO THE OWNER MAY RESULT IN LOSS OF THEIR RIGHTS AGAINST THE CONTRACTOR AND/OR HIS SURETY. THE OWNER IS NOT RESPONSIBLE IN ANY MANNER TO A CLAIMANT FOR COLLECTION OF UNPAID BILLS AND ACCEPTS NO SUCH RESPONSIBILITY BECAUSE OF ANY REPRESENTATIVE BY ANY AGENT OR EMPLOYEE.

END OF SECTION

SECTION 01 21 00 - ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary General Conditions, and other Division 1 Project Manual Sections, apply to work of this Section.

1.2 SUMMARY

A. The Contractor shall provide the Job Order Contract including any cost of testing any materials as noted on the drawings and in the specification.

1.3 As this is a Job Order Contract, any allowance item noted in the spread sheet must carefully comply with the requirements of the State of Texas Procurement Act and Job Order Contract Administration by Region V Education.

END OF SECTION

SECTION 01 21 00 - ALLOWANCES

PART 1 – GENERAL

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END OF SECTION

SECTION 01 25 13 – PRODUCT SUBSTITUION PROCEDURE

PART 1 – GENERAL

1.1 Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the contractor after award of the contract are considered requests for "substitutions". The following are not considered substitutions:
   A. Substitutions requested during the bidding period and accepted prior to award of contract.
   B. Revisions to Contract Documents requested by the owner or Architect.
   C. Specified options of products and construction methods included in Contract Documents.
   D. Compliance with governing regulations and orders issued by governing authorities.

1.2 Submittal: Requests for substitution will be considered if received within 60 days after commencement of the work. Requests received more than 60 days after commencement of the work may be considered or rejected at the discretion of the Architect.
   A. Submit 3 copies of each request for substitution in the form and in accordance with procedures for Change Order proposals.
   B. Identify the product, or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Document compliance with requirements for substitutions, and the following information as appropriate:
      1. Product data, including Drawings and descriptions of products, fabrication, and installation procedures.
      2. Samples, where applicable or requested.
      3. A comparison of significant qualities of the proposed substitution with those specified.
      4. A list of changes or modifications needed to other parts of the work and to construction performed by the owner and separate contractors that will be necessary to accommodate the proposed substitution.
      5. A statement indicating the substitution's effect on the construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall contract time.
      6. Cost information, including a proposal of the net change, if any in the contract sum.
      7. Certification that the substitution is equal-to or better in every respect to that required by Contract Documents, and that it will perform adequately in application indicated. Include contractor's waiver of rights to additional payment or time that may be necessary because of the substitution's failure to perform adequately.

1.3 Architect's Action: Within one week of receipt of the request for substitution, the Architect may request additional information necessary for evaluation. Within 2 weeks of receipt of the request, or one week of receipt of additional information, whichever is later, the Architect will notify the contractor of acceptance or rejection. If a decision on use of a substitute cannot be made within the time allocated, use the product specified. Acceptance will be in the form of a Change Order.

1.4 Substitutions: The contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise, requests will be returned without action except to record noncompliance with these requirements.
   A. Extensive revisions to Contract Documents are not required.
   B. Proposed changes are in keeping with the general intent of Contract Document.
   C. The request is timely, fully documented and properly submitted.
   D. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

E. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
F. The specified product or method of construction cannot receive necessary approval by the governing authority, and the requested substitution can be approved.
G. A substantial advantage is offered the owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the owner may be required to bear. Additional responsibilities for the owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the owner or separate contractors, and similar considerations.
H. The specified product or method of construction cannot be provided in a manner that is compatible with other materials. The contractor certifies that the substitution will overcome the incompatibility.
I. The specified product or method of construction cannot be coordinated with other materials. The contractor certifies that the proposed substitution can be coordinated.
J. The specified product or method of construction cannot provide a warranty required by the Contract Documents. The contractor certifies that the proposed substitution provide the required warranty.
K. The contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 2 – PRODUCTS
N/A

PART 3 – EXECUTION
N/A

END OF SECTION

SECTION 01 26 00 – CHANGE ORDERS / REQUESTS FOR INFORMATION

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Procedures for claims for additional costs:
B. Conditions of the Contract.
C. Application for Payment: Section 01 29 00 – Payment Procedures
D. The process for changes in work are governed by the Texas Procurement Code and Region V Education Job Order Standards.

1.2 PRELIMINARY PROCEDURES - ARCHITECT:

A. Architect may initiate changes by submitting Change Order Directive to Contractor which includes:
   1. Detailed description of Change, Products, and location of change in Project.
   2. Supplementary or revised Drawings and Specifications. Specific period during which the requested price will be considered valid.
   3. Change Order Directive is for information only; it is not an instruction to stop work in progress, or to execute the change.

1.3 PRELIMINARY PROCEDURES - CONTRACTOR:

A. Contractor may initiate changes by submitting written notice to Architect which includes:
   1. Description of proposed changes.
   2. Statement of reason for making changes.
   3. Statement of effect on Contract Sum and Contract Time.
   4. Statement of effect on Work of separate contractors, if any.
   5. Documentation supporting change in Contract Sum and Contract Time, as appropriate.
   6. Any other pertinent data and information.

1.4 DOCUMENTATION OF CHANGE PROPOSALS:

A. Support each quotation with sufficient itemized data necessary for Architect to evaluate quotation, which may include:
   1. Labor: Hourly breakdown.
   2. Equipment: Unit price and quantity.
   3. Products: Unit price and quantity.
   4. Fees: Taxes, insurance, bonds.
   5. Credit for work deleted from Contract.
   6. Justification for change in Contract Time, if any.

1.5 CONTRACTOR MAXIMUM OVERHEAD AND PROFIT:

A. Changes involving additional cost to Contractor: net cost plus percentage as defined on Bid Form.
B. Changes involving additional cost to Subcontractor: net cost plus ten percent (10%) to Subcontractor.
C. Changes involving deductions: net cost.

1.6 PREPARATION OF CHANGE ORDERS:

A. Form: AIA Document G701.

B. Content: Change Order will describe changes in work, both additions and deletions, with attachments of revised Contract Documents to define details.
C. Basis: Content will be based on Change Request and Contractor's responsive Proposal, both as mutually agreed between Owner and Contractor.
D. Change Order will provide an accounting of adjustments in Contract Sum, and in Contract Time.
E. Execution: Architect will sign and date as verification of change in Contract Sum, and Contract Time as agreed to by Owner and by Contractor.
F. Owner and Contractor will sign and date to indicate agreement of terms therein.

1.7 COORDINATION:

A. During processing period for Proposal Request/Change Order, do not proceed with operations which would subsequently encumber work affected by modifications.

1.8 CORRELATION WITH CONTRACTOR'S SUBMITTALS:

A. Periodically revise Schedule of Values and Request for Payment forms to record each change as separate item of Work, and to record adjusted Contract Sum.
B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

END OF SECTION

SECTION 01 29 00 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED SECTIONS
- A. 01 77 00 - Closeout Procedures

1.2 FORMAT
- A. Submit on AIA G702 - "Application and Certificate for Payment" and AIA G703 - "Continuation Sheet".
- B. Alternative to this method is to comply with the payment application form and standards for Texas Procurement and Region V Education Procurement Standards.

1.3 PREPARATION OF APPLICATIONS
- A. Type required information.
- B. Execute certification by signature of authorized officer.
- C. Use data on accepted Schedule of Values. Provide dollar value in each column for each line item for portion of the work performed and for stored products.
- D. List each authorized Change Order separately on continuation sheet, listing Change Order number and dollar amount as for and original item of the work.

1.4 SUBMITTAL PROCEDURES
- A. Submit 4 copies of each Application for Payment at times stipulated in Agreement.
- B. Submit a copy of each substantiating or companion document with each copy of Application unless otherwise specified.

1.5 STORED MATERIALS INSURANCE
- A. Include with each copy of Application for Payment a certificate from insurance company underwriting coverage protecting stored materials attesting to full coverage thereof.

PART 2 – PRODUCTS
N/A

PART 3 – EXECUTION
N/A

END OF SECTION

SECTION 01 29 73 – SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 DESCRIPTION:
- A. Requirements for preparation and submission of Schedule of Values as an outline for the more complete Job Order Contract Proposal and Agreement for this project.

1.2 RELATED SECTIONS:
- A. 01 29 00 - Payment Procedures.

1.3 SUBMITTALS:
- A. Submit Schedule of Values as a part of first "Application and Certificate for Payment".
- B. Submit the number of copies Contractor requires plus 3 copies which will be retained by the Architect.
- C. Submit under Architect accepted transmittal letter.

1.4 INCLUSIONS:
- A. Provide a separate line listing for each Section listed on Project Manual Table of Contents.
- B. Provide a separate line listing for each subcontract to subjects listed on Project Manual Table of Contents.
- C. For items upon which progress payments for stored materials will be requested, list separately value for:
  1. All material, shipping, handling, storage, and related costs and taxes through time of storage; and,
  2. All handling, installation, and related costs and taxes subsequent of time of storage.
- D. Include directly proportional amount of Contractor's overhead and profit in each line listing.
- E. The sum of all values listed shall equal Contract Sum.

1.5 FORMAT:
- A. Type Schedule on AIA G703 "Continuation Sheet for Application and Certificate for Payment".

1.6 SUBSTANTIATING DATA:
- A. Upon request of Architect, furnish substantiating data justifying each line listing questioned.

PART 2 - PRODUCTS - N/A

PART 3 - EXECUTION - N/A

END OF SECTION

SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 FORMAT:
- A. Prepare Schedules as a horizontal bar chart with separate bar for each major portion of the Work or operation.
- B. Sequence of Listings: Schedule of Values - chronological order of start and completion of each item of work.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: 8.5x11, 11x17, 18x24 or 24x36 (Contractor's Option).

1.2 CONTENT:
- A. Listings: Read from left to right, in ascending order for each activity. Identify each activity with applicable specifications section number.
- B. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- C. Identify each item by major Specification section number.
- D. Provide sub-schedules to define critical portions of entire Schedule as necessary.
- E. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of following activities, if necessary.
- F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including, and dated reviewed submittals will be required from Architect. Show critical decision dates for selection of finishes.
- G. Show dates for each specified test that is critical to scheduling compliance.

1.3 REVISIONS TO SCHEDULES:
- A. Maintain schedules to record actual start and finish dates of completed activities. Indicate progress of each activity to date of revision and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

1.4 SUBMITTALS:
- A. Submit initial Schedules within 15 days after date established in Notice to Proceed. After review, resubmit required revised data within 7 days.
- B. Submit revised Progress Schedules with each Application for Payment.

1.5 DISTRIBUTION:
- A. Distribute copies of reviewed Schedules to job site file, subcontractors, suppliers, and other concerned entities. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

PART 2 - PRODUCTS - N/A

PART 3 - EXECUTION - N/A

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:
- A. Definitions and additional responsibilities of parties are in the Conditions of the Contract.
- B. Submittal of subcontractor, supplier, and materials list.
- C. Submittals required for contract closeout.
- D. Submittals of required project record documents.

1.2 TRANSMITTAL LETTER:
- A. Contractor's name and job number.
- B. Date submittal was sent from Contractor's office.
- C. Description of submittal and number of copies submitted.
- D. Subcontractor's name, supplier's name, and engineer's name as applicable.
- E. Indicate deviations from the Contract Documents, if any, and reasons for deviations.

1.3 SUBMISSION REQUIREMENTS:
- A. Shop Drawings, Product Data, Samples, Certifications, Test Results:
  1. Make submittals promptly in accordance with Submittal Schedule, and in such sequence as to cause no delay in the Work or in the Work of any other Contractor. Copies will be reviewed and turned over to Owner's personnel; or they will be returned with comments for resubmission, if necessary.
- B. Progress Schedule: Submit within 15 days of Contract execution.
- C. RESUBMISSION REQUIREMENTS: Make any corrections for changes in the submittals required by the Architect/Engineer and resubmit until approved.
- D. Progress Schedule, Shop Drawings and Product Data:
  1. Revise initial drawings or data and resubmit as specified for the initial submittal. Indicate any changes which have been made other than those requested by the Architect.
- E. Samples: Submit new samples as required for initial submittal.
- F. Certifications: Resubmit within ten (10) days.
- G. Operation/Maintenance Manual: Resubmit within ten (10) days.

PART 2 - CONTENTS OF SUBMITTALS

2.1 PROGRESS SCHEDULE:
- A. As per Section 01 32 16 – Construction Progress Schedule.

2.2 SHOP DRAWINGS:
- A. Prepared by qualified detailer.
- B. Identify details by reference to Specification Section, sheet and detail members shown on Drawings.
- C. Content:
  1. Date of Submission and the date of any previous submission.
  2. Project title and number.
  3. Names of Contractor, supplier, manufacturer.
  4. Identification of the product.
  5. Field dimensions clearly identified as such.
  6. Relations to adjacent or critical features of the Work or materials.
  7. Applicable standards, such as ASTM or Federal Specification Numbers.
  8. Identification of deviations from Contract Documents.
  9. Identification of revisions on resubmittals.
  10. An 8 inch x 3 inch blank space for Contractor and Architect stamps.
- D. No extension of time will be granted for failure to have shop drawings submitted in ample time for review

2.3 PROJECT DATA:

A. Preparation: Manufacturer's printed data or catalog sheets showing illustrated cuts of items specified.
B. Content:
    1. Clearly mark each copy to identify pertinent products or models.
    2. Show performance characteristics and capacities.
    3. Show dimensions and clearances required.
    4. Show wiring or piping diagrams and controls.
    5. Modify drawings and diagrams to delete information which is not applicable to Work of this Project.
C. Supplement standard information to provide information specifically applicable to Work of this Project, including:
    1. Applicable standards, such as ASTM or Federal Specification number.
    2. Identification of deviations from Contract.
    3. Identification of revisions on resubmittals.

2.4 SAMPLE:
A. Office samples of sufficient size and quantity to clearly illustrate functional characteristics of the product, with integrally related parts and attachment devices, in full range of color, texture and pattern.

2.5 CERTIFICATIONS:
A. Definition: Certifications are manufacturer's testimonials prepared by him or by an independent testing agency which certify conformance with specified requirements.
B. Content: Identify product by reference to specification Section, and by reference to applicable Drawings. Clearly mark each copy to identify pertinent model, if more than one certification is required.

2.6 OPERATION/MAINTENANCE MANUAL:
A. Preparation:
B. Size: 8 1/2 inches x 11 inches.
C. Paper: White typed pages.
D. Test: Manufacturer's printed data, or neatly typewritten.
E. Drawings:
    1. Provide reinforced punched binder tab, bind in with text.
    2. Fold larger drawings to size of text pages.
    3. Provide fly-leaf to each separate product, or each piece of operating equipment.
    4. Provide typed description of product, and major component parts of equipment.
F. Provide indexed tabs.
G. Cover:
H. Identify each volume with typed or printed title “OPERATING AND MAINTENANCE INSTRUCTIONS", listing:
    1. Title of Project.
    2. Identity of separate sections as applicable.
    3. Identity of general subject matter covered in the manual.
I. Binders: Commercial quality three-ring binders with durable and cleanable plastic covers.
J. Maximum Ring Size: 1 inch.
K. When multiple binders are used, correlate the data into related consistent groupings.
L. Minimum Content:
    1. Subcontractor, supplier, and manufacturer list for each volume with name of responsible, principal, address, and telephone number.
    2. Identification of each product by product name and identifying symbols as set forth in Contract Documents.
    3. Local source of supply for parts and replacements.
    4. Warranties and bonds as specified.
    5. Shop drawings and product data as specified in individual Sections.
    6. Include additional drawings as necessary to clearly illustrate relations of component parts of systems, including control and flow diagrams.

7. Written text as required to supplement product data for the installation which provides a logical sequence of instructions for each procedure.

2.7 MANUALS FOR EQUIPMENT AND SYSTEMS:

A. Description for unit and component parts:
   1. Function, normal operating characteristics, and limiting conditions.
   2. Performance curves, engineering data, and tests.
   3. Complete nomenclature and commercial number of replaceable parts.

B. Operating Procedures:
   1. Start-up, break-in, and routine and normal operating instructions.
   2. Regulation, control, stopping, shut-down, and emergency instructions.
   3. Summer and winter operating instructions.
   4. Special operating instructions.

C. Maintenance Procedures:
   1. Routine operations.
   2. Guide to "Trouble-shooting".
   3. Disassembly, repair, and reassembly.
   4. Alignment, adjusting, and checking.
   5. Lubrication schedule and list of required lubricants.
   6. Description of sequence of controls operation including as-installed control diagram.
   7. Manufacturer's parts list, illustrations, and assembly drawings; indicate items recommended to be stocked as spare parts.
   8. As-installed color coded piping and wiring diagrams.
   9. Charts of valve tag numbers with location and function of each valve.
   10. Circuit directories of panel boards.

2.8 COLOR SELECTIONS SUBMITTALS:

A. Provide samples, chips, charts, and boards as required for Architect to prepare Color Schedule at least 3 weeks prior to critical decisions being necessary.

2.9 SUBMITTAL SCHEDULE:

A. Shop Drawings and Product Data: Submit direct prints for product items listed in individual Sections.
B. Samples: Quantity indicated in individual Section.
C. Certifications: 4 copies.
D. Operation/Maintenance Manual: 2 copies.
E. Manual for Equipment and Systems: 2 copies.
F. Color Selection Package: 1 copy.

2.10 DISTRIBUTION:

A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Architect Stamp to:
   1. Record Document file.
   2. Subcontractors.
   3. Supplier or Fabricator.

END OF SECTION

SECTIONS 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 INDUSTRY STANDARDS:

A. General: Applicable standards of construction industry have same force and effect (and are made a part of Contract Documents by reference) as if published copies were bound herewith.
B. Referenced Standards (referenced directly in Contract Documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to Work.
C. Non-Referenced Standards recognized in the construction industry are hereby defined, except as otherwise limited to have direct applicability to the Work herein and will be so enforced.
D. Publication Dates: Where compliance with a standard is required, comply with standard in effect as of date of Contract Documents, unless reference is made to specific earlier date.
E. Copies of Standards: Provide where needed for proper performance of the Work; obtain directly from publication sources. Maintain at site for reference by concerned parties.

1.02 ABBREVIATIONS AND NAMES:

A. Where acronyms or abbreviations are used in Specifications, they are defined to mean the industry-recognized name of trade association, standards generating organization, governing authority or other entity applicable to provision.
B. The following acronyms or abbreviations as referenced in individual Sections are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of Contract Documents:

AA	Aluminum Association
AAMA	American Architectural Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ACE	Air Conditioning Engineers, Inc.
ACI	American Concrete Institute
ADA	American with Disabilities Act
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWSC	American Welding Society Code
AWWA	American Water Works Association
BFPM	Beat to Fit, Paint to Match
BHA	Beaumont Housing Authority
BIA	Brick Institute of America
CBMA	Certified Ballast Manufacturers' Association
DHI	Door and Hardware Institute
ETL	Electrical Testing Laboratories
FM	Factory Mutual
FS	Federal Specification of Federal Standards
IES	Illuminating Engineering Society
HUD	Department of Housing and Urban Development
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Bureau of Fire Underwriters

NBS	National Bureau of Standards
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers' Association
NFC	National Fire Code
NFPA	National Fire Protection Association Officials
PCA	Portland Cement Association
PDCA	Painting and Decorating Contractors of America
PDI	Plumbing and Drainage Institute
RIS	Redwood Inspection Service
SDHPT	State Department of Highways and Public Transportation
SDI	Steel Deck Institute
S.D.I.	Steel Door Institute
SMACNA	Sheet Metal and Air Conditioning National Association
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council
TAS	Texas Accessibility Standards
TDH	Texas Department of Health
TDLR	Texas Department of Licensing and Regulation
TNRCC	Texas Natural Resources Conservation Commission
USDA	United States Department of Agriculture
UL	Underwriter's Laboratories, Inc.
WWPA	Western Wood Products Association

1.03 ADDITIONAL DEFINITIONS:

A. As required: Methods that may be required to satisfactorily complete the Work.
B. Substrate: Surface or base over which another material is to be applied.
C. As Directed: Supplemental instructions within the scope of the Contract. (Make request to Architect for instruction in each case required.)
D. Architect: Architect identified in General Conditions and refers to his acting individually or through any of his representatives only when duly authorized to act for him.
E. Provide: To furnish and install, complete, operational, and ready for use.
F. Approve: Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by contractor, the term "approved" will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will Architect's approval be interpreted as a Contractor’s release responsibilities to fulfill requirements of Contract Documents or acceptance of any Work.
G. Concealed: Hidden from sight as in chases, furred spaces, and above gypsum board ceilings; exposed materials are understood to be open to view.

END OF SECTION

SECTION 01 45 00 – QUALITY CONTROL

PART 1 – GENERAL

1.1 REQUIREMENT NEEDED
- A. General quality control.
- B. Mockups and field samples.
- C. Manufacturer's field services.
- D. Testing laboratory services.

1.2 QUALITY CONTROL, GENERAL
- A. Maintain quality control over suppliers, mfrs., products, services, site conditions, and workmanship, to produce work of specified quality.

1.3 MOCKUPS AND FIELD SAMPLE
- A. Provide samples on-site to match existing wall panels.
- B. Acceptable in-place mockups may be retained in completed work.

1.4 MANUFACTURERS' FIELD SERVICES
- A. When specified, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, as applicable, and to make appropriate recommendations.
- B. Representative shall submit written report to Architect listing observations and recommendations.

1.5 TESTING LABORATORY SERVICES: (Reference Section 00 14 10) Testing and Laboratory Services Provided Under Separate Contract with Owner.
- A. Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
  1. Notify Architect and testing laboratory 24 hours prior to expected time for operations requiring testing services.
  2. Make arrangements with testing laboratory and pay for additional samples and tests for contractor's convenience.

END OF SECTION

SECTION 01 45 16.13 – CONTRACTOR REQUIREMENTS

PART 1 - GENERAL

1.1 INTERPRETATION:

A. The following paragraphs contain requirements that apply to the overall accomplishment of the work. Where specified action is required by this section, it is the contractor's responsibility to perform or to assign such requirement to subcontractor and see that it is performed.

1.2 RELATIONSHIP BETWEEN TRADES:

A. Require and be responsible for cooperation and coordination between various trades and subcontractors whose work is dependent upon one another. Schedule such work to prevent delays in dependent work and so that all related work will progress together. Fully inform each trade or subcontractor of the relation of his work to other work and require each to make necessary provisions for the requirements of such other work. No additional compensation for extra work incurred through the lack of cooperation and coordination between various trades and subcontractors will be allowed.

1.3 PROTECTION:

A. Assume the responsibility for initiation and maintenance of protective requirements specified in Section 01 50 00 – Temporary Facilities and Controls.

1.4 REPAIR OF DAMAGE:

A. Assume responsibility for any loss or damage caused by these operations or any trade to the work, or to materials, to adjacent property and existing structures and to persons, and make good any loss, damage or injury without cost to owner.

1.5 SECURITY:

A. Conform to requirements of public laws, ordinances and regulations and the requirements of insurance carriers concerning security to the site while work is in progress as well as when it has been suspended.

1.6 DOCUMENTS AT THE SITE:

A. Maintain at the site, one reference copy of each approved shop drawing and of each drawing, specification, addenda, revision, and other modification, in good order and marked by note to record each change made during construction on record prints. Drawings shall be clearly marked "RECORD PRINTS" and not used for construction purposes. Mechanical Record Drawings shall show actual CFM rating in each space. At the time of pre-final inspection, submit the record prints to the Architect. Also obtain, when directed or as necessary to properly execute the work, copies of literature, standards and other data referred to but not included in the specifications.
B. The record prints will be checked periodically by the Architect to determine that they are current. A certificate for payment will not be issued until record prints are made current as determined by the Architect.
C. Refer to Section 01 78 39 for additional record drawings requirements.

1.7 CONSTRUCTION LOADING:

A. Concrete slabs on grade, unless designated otherwise on the drawings, have not been designed for heavy loading. Do not subject such slabs on grade to excessive loading by shoring, storage of materials or operation of construction equipment unless adequately protected by planking. Maintenance of slabs in good condition is the responsibility of the Contractor, who shall remove all damaged areas of such slabs and replace them with new work at no cost to owner.

1.8 EXITING UTILITIES:

A. Shut-downs for utility tie-ins shall be scheduled to minimize inconvenience to the owner. The contractor shall notify the owner and Architect in writing 10 days in advance of any anticipated shut-down. The Contractor provides adequate manpower on hand to assure that tie-ins can be completed on schedule. The shut-down shall be scheduled with the agreement of the owner and the contractor.

1.9 CONSTRUCTION SCHEDULING:

A. The work shall be conducted in such a way as to cause a minimum of interference with the owner's use of existing facilities during normal working hours.
B. Scheduling of work and access to site will be discussed during the Preconstruction Conference.

1.10 JOB SIGN

A. Provide 4'x 4' professionally constructed and prepared job sign utilize MDO board and die cut lettering for text and graphics based on design to be submitted by architect's office upon award of the contract for construction.

END OF SECTION

SECTION 01 45 29 – TESTING LABORATORY SERVICES

(TESTING LABORATORY SERVICES UNDER SEPARATE CONTRACT WITH OWNER)

PART 1 - GENERAL

1.1 TESTING LABORATORY:

A. Owner will employ and pay for services to perform specified testing.
B. Contractor shall cooperate with laboratory to facilitate execution of its required services.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. Inspections and Testing Required by Laws, Ordinances, Rules, Regulations, Orders or Approvals of Public Authorities: Conditions of the Contract.
B. Certification of Products: Respective Specification Sections.
C. Test, Adjust and Balance of Equipment: Respective Specification Sections.
D. Laboratory Tests required and Standards for Testing: Each Section listed.

1.3 TESTING LABORATORY INSPECTION, SAMPLING AND TESTING IS REQUIRED FOR:

A. Excavation, Grading and Fill: Section 31 23 00
B. Portland Cement Concrete Paving: Section 32 13 00
C. Cast-in-Place Concrete: Section 03 30 00
D. Mortar: Section 04 05 13

1.4 QUALIFICATION OF LABORATORY:

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
B. Meet requirements of ASTM E329, "Standard Recommended Practice for Inspecting and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction."
C. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection. Include memorandum of remedies of any deficiencies reported.
D. Maintain testing equipment calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.

1.5 LABORATORY AUTHORITY AND DUTIES:

A. Testing laboratory is not authorized to revoke, alter, relax, enlarge, or release any requirements of the Contract Documents or to approve or accept any portion of the Work. The laboratory does not have the right of rejection or the right to stop the Work, except for such reasonable periods as may be required to conduct the sampling, testing, and inspection operations. Notify all concerned parties when it appears that the materials tested or inspected do not comply with the project requirements.
B. Within four (4) days of testing, submit three (3) copies of each test and inspection report to Architect and one copy each to Contractor's offices.
C. Reports shall include:
    Date issued.
    Project title and number.
    Testing laboratory name, address, and telephone number.
    Name and signature of laboratory inspector.
    Date and time of sampling or inspection.

Record of date of test, temperature, and weather conditions.
Identification of project and specification section.
Location of sample or test in the Project.
Type of inspection or test.
Results of tests and compliance with Contract Documents.
Interpretation of test results.

1.6 CONTRACTOR'S DUTIES:

A. Cooperate with laboratory personnel; provide access to Work, and to manufacturer's operations.
B. Secure for laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
C. Provide to laboratory preliminary design mix proposed to be used for concrete, and other materials mixes which require control by testing laboratory.
D. Furnish copies of Products test reports as required.
E. Furnish incidental labor and facilities:
    To provide access to Work to be tested.
    To obtain and handle samples at the Project site.
    To facilitate inspections and tests.
    For storage of test samples.
F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
G. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
H. Employ and pay for services of separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required: For Contractor's convenience.
I. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

1.7 SCHEDULE OF TESTING REQUIRED

A. Section 31 23 00 - Excavation, Grading and Fill:
    1. Field observation and verification of suitability of sub grade soils to support foundations.
    2. Determination of extraction/gradation and of plasticity index of select fill materials.
    3. Determination of acidity range of topsoil materials.
    4. In-place field density tests for backfill, one test per 30 LF of backfilled trench, per lift.
    5. Pocket penetrometer tests on the founding soil of drilled and under reamed footings, tests at random of 25% of footings.
    6. In-place field density tests for backfill, one test per 30 LF of backfilled foundation, per lift.
B. Section 32 13 13 - Concrete Paving:
    1. Determination of extraction/gradation and of plasticity index of select fill material.
    2. In-place field density tests of compacted sub grade, 8 such test at random.
    3. In-place field density tests of compacted select fill, 10 such tests at random.
C. Section 03 30 00 - Cast-in-Place Concrete:
    1. Review proposed mix designs.
    2. Produce production samples of fresh concrete, cure, cap, test and report results in accordance with ASTM C 39, 4 cylinders for each 50 cubic yards place.
    3. Verification of normal weight aggregates meeting ASTM C 33.
D. Section 04 05 13 - Mortar:
    1. Review proposed mix designs.
    2. Produce production samples of fresh mortar; cure, cap, test and report results, 2 cubes per test, one test required for each type of mortar per 10 cubic yards.

END OF SECTION

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 TEMPORARY CONSTRUCTION:
- A. Provide facilities for the use of employees, subcontractors, and other authorized personnel.
- B. Remove temporary installations and connections when no longer required or when directed by Architect.
- C. Repair damage caused by defective temporary systems; restore facilities used during construction to specified original condition.

1.2 FIELD OFFICE: **(May be waived is construction occurs during summer month)**
- A. Provide small storage shed for storage of plans/specifications/as-built drawings.
- B. Provide field office equipped with heat and cooling, lights, plan desks and plan files.
- C. Provide fax machine in the field office.
- D. Field office shall be equipped with conference table and chairs capable of seating 10-14 individuals for monthly meetings with Owner, Architect, Engineers, Contractor(s), etc., held in this office.
- E. Provide small under-counter refrigerator stocked continuously with two (2) cans Diet Doctor Pepper.

1.3 TELEPHONE:
- A. Provide temporary telephone for use by persons involved with project (cell acceptable).

1.4 TOILET:
- A. Provide exterior portable toilet facility for construction crews.
- B. Maintain facilities clean, sanitized and secured within the boundary of the required 6’ security fence.

1.5 TEMPORARY POWER AND LIGHT:
- A. Contractor provide temporary electrical power and service to the building until such time permanent power is to be turned on for owner’s service. All cost for power until building is turned over to owner to be covered under this contract.

1.6 TEMPORARY WATER :
- A. Connect to existing facilities.
- B. Free use of water is allowed.

1.7 VENTILATION:
- A. Provide ventilation of enclosed areas to cure materials to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases.
- B. Prior to operation of permanent facilities for temporary purposes, verify that installation is approved for operation and that filters are in place. Coordinate conditions of use and equipment guarantees with owner.

1.8 TEMPORARY ENCLOSURES AND BARRIERS:
- A. Provide weather tight enclosures to protect Work from elements, and to retain temporary heat.
- B. Provide barriers as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- C. Provide 6’ chain link fence around building construction site and lay-down area, with vehicular and pedestrian gates.
- D. Provide barricades and covered walkways as required by governing authorities for public rights-of-way.
- E. Provide barriers around trees and plants designated to remain.

F. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and ponding or continuously running water.
G. Contractor must provide barrier around excavations during the day. No excavation, unless within the confines of the 6'-0" chain link fenced construction barrier, may be left open overnight unless a guard is on duty throughout the night to prevent accidents.
H. Provide silt fence protection as required by the governing authority and State of Texas regulations and submit for approval a silt fence plan for approval by the city before starting any work on the site. Contractor must keep silt fence in good condition throughout the sequence of construction as required by the governing authority. Reference Civil Drawings.

1.9 PUMPS:
A. Provide and operate drainage and pumping equipment to maintain excavations and site free of standing water.

1.10 CONSTRUCTION AIDS:
A. Provide scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other equipment required to facilitate execution of the Work.

1.11 SECURITY:
A. When the Work or any portion thereof is suspended for a temporary period, secure and protect the area to prevent injury and loss.
B. Contractors are encouraged to provide security pole lighting through the construction process and video cameras should security become an issue that might delay completion of the project.

1.12 SIGNS
A. The Contractor shall supply, erect, and maintain a professionally fabricated 4'' x 4' project sign as approved by the Owner prior to fabrication based on drawing submitted by the architect..

1.13 SAFETY
A. The Contractor must assign a safety coordinator for the project site and maintain a safety manual throughout the sequence of construction.
B. The Contractor must comply with all OSHA and best application safety standards for the project including their personnel and all other subcontractors and suppliers that are permitted to enter the secured fenced area or utilizing construction vehicles or equipment.
C. The Contractor must immediately report to the Owner and Architect any and all injuries related to this project or occurring on this project site and submit a written report of incident, treatment and condition.

END OF SECTION

SECTION 01 71 23 – FIELD ENGINEERING AND LAYOUT

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Procedures for maintaining Project Record Documents are outlined in Section 01 78 39

1.2 QUALIFICATIONS OF SURVEY PERSONNEL:

A. Certify that Contractor's personnel responsible for layout operations have provided this professional service on 5 projects of similar scope within the preceding 5 years.
B. Proceed with field engineering only when qualifications have been established.

1.3 PROPERTY CORNER MONUMENT PERPETUATION:

A. Protect existing corner monuments, if any.
B. Notify Architect prior to beginning survey if any, indicating monument is not in place.
C. If destroyed or disturbed, inadvertently or by new construction requirements, have re-monument by Registered Land Surveyor and furnish copy of Surveyor's drawings and certification of placement to Owner and to Architect.

1.4 PROJECT SURVEY REQUIREMENTS:

A. Engage qualified surveyor, acceptable to Owner, to perform surveys, layouts and measurements.
B. Align new Work on site; run axis lines locating Work; establish and mark vertical and horizontal control points.
C. Locate all components and improvements on the site and establish horizontal and vertical control Points.
D. Preserve above lines and points throughout construction.
E. Locate and layout site improvements, including grade stakes, utility slopes, and invert elevations.
F. Locate and construct batter boards for structures.
G. Locate building foundation and floor levels.
H. Establish controlling lines and levels required for mechanical and electrical Work.
I. Periodically recheck layouts to verify accuracy.
J. Maintain complete, accurate log of controls and surveys.

1.5 BURIED UTILITIES:

A. Flag buried utility lines indicated to remain including primary electrical service lines.
B. Take measurements and verify dimensions of existing structures that affect current construction, and to which current construction is to be fitted.

END OF SECTION

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED WORK:

A. The general provisions of the contract, including General and Supplementary Conditions and other General Requirements sections, apply to the work specified in this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definition: “Cutting-and-Patching” is hereby defined to include but is not necessarily limited to the cutting and patching for nominally completed and previously existing work, in order to accommodate the coordination of work, or the installation of other work, or to uncover other work for access or inspection, or to obtain samples for testing, or for similar purposes; and is defined to exclude integral cutting-and-patching during the manufacturing, fabricating, erecting and installing process for individual units of work. Drilling the work to install fasteners and similar operations are excluded from the definition of cutting-and-patching.
B. Restoring or removing and replacing non-complying work is specified separately from cutting-and-patching but may require cutting-and-patching operations as specified herein.
C. Refer to other sections of these specifications for specific cutting-and-patching requirements and limitations applicable to individual units of work.
D. Refer to the Division 23 and Division 26 sections, for additional requirements and limitations on the cutting-and-patching of mechanical and electrical work, respectively. The requirements of this section apply to mechanical and electrical work, unless otherwise indicated.
E. Contractor is required to cut and patch to original conditions running new mechanical and electrical services runs or where performing demolition on certain portions of pavement requiring generally acceptable patching for transitions of surfaces including compliance with street standards where installing new drives and Texas Department of Licensing and Regulation standards.

1.3 Special Procedures: Section 01 35 00

1.4 Selective Demolition: Section 02 41 19

1.5 CONTRACTOR OPERATIONS:

A. Provide cutting, patching, and fitting, including attendant excavation and backfill, required to:
   1. Make components fit together properly.
   2. Uncover portions of the Work for installation of ill-timed work.
   3. Remove and replace defective work.
   4. Remove and replace work not conforming to requirements of Contract Documents.
   5. Remove samples of installed work as specified for testing.
   6. Provide penetrations of surfaces for installation of piping, electrical conduit, and control systems components, including sleeves, anchors, inserts and frames, including limitations expressed for structural components.

1.6 INSPECTION:

A. Inspect existing conditions including components subject to damage or to movement during cutting and patching.
B. After uncovering Work, inspect conditions affecting installation of Products, or performance of Work.

C. Report unsatisfactory or questionable conditions to Architect and Owner in writing; proceed with Work thereafter only in accordance with further instructions from Architect and Owner.

1.7 PREPARATION:

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.
B. Provide devices and methods to protect other portions of Project from damage.
C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

1.8 PERFORMANCE:

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
C. Refinish entire surfaces as necessary to leave an even finish which matches adjacent finishes.
D. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART I – GENERAL

3.1 RELATED DOCUMENTS:
- A. The general provisions of the contract, including General and Supplementary Conditions and other General Requirements sections, apply to the work specified in this Section.

3.2 DESCRIPTION OF REQUIREMENTS:
- A. Definitions: Closeout is hereby notified to include General Requirements near the end of contract time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 48. Special Requirements for Mechanical and Electrical work are specified in Divisions 23 & 26 Series Sections, respectively. Time of closeout is directly related to "Substantial Completion".
- B. Refer to Division 1 sections for final payment requirements and related provisions.
- C. Refer to Division 1 sections for general submittal requirements.

3.3 PREREQUISITES TO SUBSTANTIAL COMPLETION:
- A. General: Prior to requesting Architect's/ Engineer's Inspection for certification of Substantial Completion, as required by General Conditions (for either the entire work or portions thereof), complete the following and list known exceptions in request:
  1. In progress payments, show either 100% completion for portion of work claimed as "Substantially Complete", or list incomplete items, value of incompletion, and reasons for being incomplete.
  2. Advise owner of pending insurance change-over requirements.
  3. Deliver tools, spare parts, extra stocks of materials, and similar physical items to owner.
  4. Make final change-over of locks and transmit keys to owner, and advise owner's personnel to change-over in security provisions.
  5. Complete start-up testing of systems, and instructions of owner's operating/ maintenance personnel. Discontinue (or change-over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
  6. Complete final cleaning-up requirements.
- B. Inspection Procedures: Upon receipt of contractor's request, Architect/Engineer will either proceed with inspection or advise contractor of prerequisites not fulfilled. Following initial inspection, Architect/Engineer will either prepare Certificate of Substantial Completion, or advise contractor of work that must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

3.4 PREREQUISITES TO FINAL ACCEPTANCE:
- A. General: Prior to requesting Architect's/ Engineer's final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:
  1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted, as specified in Division 1 sections. Include certificates of insurance for products and completed operations where required.
  2. Submit updated final statement, accounting for additional (final) changes to the Contract Sum.
  3. Submit certified copy of Architect's/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect/Engineer.
  4. Submit "as-built" record drawings, maintenance manuals. (Final project photographs, damage or settlement survey, property survey, and similar final record information, if necessary.)

5. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
6. Complete final cleaning-up requirements, including touch-up of marred surfaces.
7. Submit consent of surety.
8. Submit, if required, final liquidated damages settlement statement.
9. Certification of fire alarm system installation.
10. Building Official's “Certificate of Occupancy" and letter from Fire Marshall stating that he has inspected building and that it has been constructed in accordance with local Fire Code.

3.5 Re-inspection Procedure: Upon receipt of contractor's notice that work has been completed, including punch-list, items resulting from earlier inspections, and accepting incomplete items delayed because of acceptable circumstances, Architect/Engineer will re-inspect work. Upon completion of re-inspection, Architect/Engineer will either prepare certificate for final acceptance or advise contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

3.6 RECORD DOCUMENT SUBMITTALS:

A. General: Specific requirement for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions, with additional provisions indicated in Division 23 & 26-Series sections for Mechanical and Electrical work, respectively. General submittal requirements are indicated in the Division 1 sections. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistance location; provide access to record documents for Architect's/Engineer's reference during normal working hours.

B. Record Drawings: Maintain a white-print set (blue-line or black-line) of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" conditions fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on contract drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related Change Order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

C. Maintenance Manuals: Organize maintenance-and-operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb-tabbed); examples: Elevators, Food Serving Equipment, Finish Floor Maintenance, Roof Maintenance. Include emergency instructions, spare parts listing, warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar applicable information. Bind each manual of each set in a heavy-duty 2", 3-ring vinyl covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

PART II - PRODUCTS (Not Applicable)

PART III - EXECUTION

3.1 Closeout Procedures: Arrange for each installer of work requiring continuing maintenance (by owner) or operation, to meet with owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities of operational

equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.

3.2 Listing of Instructions: Specifically, but not necessarily by way of limitation, provide instruction to owner's personnel on the following categories of work:

A. Refer to Division 23 & 26 Series sections for Mechanical and Electrical equipment instructions.

3.3 FINAL CLEANING:

A. General: Special cleaning or specific units of work is specified in sections of Divisions 2 through 48. General cleaning during progress of work is specified in General Conditions and as temporary services in the Division 1 sections. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required.
   1. Remove labels which are not required as permanent labels.
   2. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass.
   3. Clean exposed exterior (new construction, except as otherwise provided in contract documents) and interior hard-surfaced finishes, including metals, masonry, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbances of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
   4. Wipe surfaces of mechanical and electrical equipment clean, and similar equipment in addition to that specified in Divisions 23 and 26; remove excess lubrication and other substances.
   5. Remove debris and surface dust from limited-access spaces.
   6. Clean concrete floors in non-occupied spaces broom-clean.
   7. Vacuum clean carpeted surfaces and similar soft surfaces.
   8. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.
   9. Clean light fixtures and lamps so as to function with full efficiency.
   10. Clean project site (yard and grounds), including landscape, development areas, of litter and foreign substances: Sweep paved areas to a broom-clean condition; remove stains, petrochemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.
   11. Removal of Protection: Except as otherwise indicated or requested by Architect/Engineer, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work and existing covered walkways.

B. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

3.4 CONTINUING INSPECTIONS:

A. General: Except as otherwise required by specific warranties, agreements to maintain, workmanship/maintenance bonds, and similar continuing commitments, comply with owner's request to participate in inspections at end of each time period of such continuing commitments. Participate in general inspection of the work approx. one year beyond date(s) of Substantial Completion.

END OF SECTION

SECTION 01 78 23 – OPERATION AND MAINTENANCE DATA

PART I – GENERAL

1.1 REQUIREMENTS INCLUDED:
- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
- B. Furnish any special tools provided by manufacturer for such maintenance and operation.
- C. Instruct Owner's personnel in operation of equipment and systems.

1.2 RELATED REQUIREMENTS
- A. Section: Closeout Procedures

1.3 FORM OF SUBMITTALS
- A. Prepare data in form of an instructional manual for use by Owner's personnel. Submit two copies of complete manual in final form.
- B. Format:
  1. Size: 8 1/2 x 11 inches.
  2. Text: Manufacturer's printed data, or neatly typewritten.
  3. Drawings:
     a. Provide reinforced punched binder tab; bind in with text.
     b. Fold larger drawings to size of text pages.
  4. Provide fly-leaf for each separate product, or each piece of operating equipment.
     a. Provide typed description of product, and major component parts of equipment.
     b. Provide indexed tabs.
  5. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List the following:
     a. Title of project.
     b. Identity of separate structure as applicable.
     c. Identify of general subject matter covered in the manual.
  6. Binders:
     a. Commercial quality three-ring binders with durable and cleanable plastic covers.
     b. Maximum ring size: 1 inch.
     c. When multiple binders are used, correlate the data into related consistent groups.

1.4 CONTENT OF MANUAL
- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
  1. Contractor, name of responsible principal, address, and telephone number.
  2. A list of each product required to be included, indexed to content of the volume.
  3. List, with 3 EACH product, name, address, and telephone number of:
     a. Subcontractor or installer.
     b. Maintenance contractor, as appropriate.
     c. Identify area of responsibility of each.
     d. Local source of supply for parts and replacement.

  4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:

1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
    a. Clearly identify specific product or part installed.
    b. Clearly identify data applicable to installation.
    c. Delete references to inapplicable information.

C. Drawings:
1. Supplement product data with drawings as necessary to clearly illustrate:
    a. Relations of component parts of equipment and systems.
    b. Control and flow diagrams.
    c. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
    d. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:
1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.
3. Copy of each warranty and service contract issued.
4. Provide information sheet for Owner's personnel, indicating:
    a. Proper procedures in event of failure.
    b. Instances which might affect validity of warranties.

E. Other information required by pertinent Sections of the Project Manual.

1.5 INSTRUCTION OF OWNER'S PERSONNEL
A. Prior to final inspection of acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment systems.
B. Operating and maintenance manual shall constitute the basis of instruction.
C. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

SECTION 01 78 33 – BONDS AND WARRANTIES

PART 1 – GENERAL

1.1 Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the owner.

1.2 Special Warranties are written warranties required by or incorporated in Contract Documents, to extend time limits provided by standard warranties or to provide greater rights for the owner.

A. Refer to the General Conditions for terms of the contractor's special warranty of workmanship and materials.

1.3 Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the contractor.

1.4 Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

1.5 Reinstatement of Warranty: When work covered by a warranty has failed and been corrected, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

1.6 Replacement Cost: On determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of contract documents. The contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the owner has benefited from use of the work through part of its useful service life.

1.7 Owner's Recourse: Written warranties made to the owner are in addition to implied warranties, and shall not limit duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the owner can enforce such other duties, obligations, rights, or remedies.

1.8 Rejection of Warranties: The owner reserves the right to reject warranties and limit selections to products with warranties not in conflict with requirements of the Contract Documents.

1.9 The owner reserves the right to refuse to accept work where a special warranty or similar commitment is required, until evidence is presented that entities required to countersign commitments are willing to do so.

1.10 Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties on the Architect's request.

1.11 When a designated portion of the work is completed and occupied or used, by separate agreement with the contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the work.

1.12 When a special warranty is to be executed by the contractor, or the contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the owner through the Architect for approval prior to final execution.

1.13 Refer to individual sections of Divisions 2 through 16 for specific content, and particular requirements for submittal of special warranties.

1.14 Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 1/2" by 11" paper.

1.15 Provide heavy paper dividers with celluloid covered tabs for each warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.

1.16 Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project Title, or name, and the name of the contractor.

1.17 When operating and maintenance manuals are required for warranted construction, provide additional copies of each warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS

N/A

PART 3 – EXECUTION

NA

END OF SECTION

SECTION 01 78 39 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 REQUIRED DOCUMENTS, ONE COPY:
- A. Project Manual.
- B. Drawings.
- C. Addenda.
- D. Reviewed Shop Drawings.
- E. Change Orders.
- F. Other Contract Modifications.
- G. Test Reports.
- H. Warranties.
- I. Color Samples (actual paint samples on board for each color with mix number/name)
- J. Store documents apart from documents used for construction.
- K. Maintain documents in clean, dry legible condition.
- L. Make documents available for inspection.

1.2 RECORDING:
- A. Label each document PROJECT RECORD in neat, large, printed letters.
- B. Record information concurrently with construction progress; do not conceal Work until required information is recorded.
- C. Legibly mark Drawings and Shop Drawings to record deviations from Construction Documents including:
  1. Depths of various elements of foundation in relation to finished floor.
  2. Horizontal and vertical locations of underground utilities and appurtenances by reference to permanent surface improvements.
  3. Location of internal utilities and appurtenances concealed in construction by reference to visible and accessible features.
  4. Field changes of dimension and detail.
  5. Changes made in the field or by Change Order.
- D. Legibly mark each deviation from Section of Specifications and Addenda to record deviations from Construction Documents including:
  1. Manufacturer, trade name, catalog number, and supplier of each Product and item of equipment installed.
  2. Changes made in the field or by Change Order.

1.3 SUBMITTAL:
- A. At Contract Closeout, deliver record documents to Owner, with transmittal letter indicating:
  1. Date
  2. Project title and number
  3. Contractor's name and address
  4. Title and number of each record document
  5. Certification that each document as submitted is complete and accurate.
  6. Signature of Contractor or his authorized representative.

END OF SECTION

SECTION 01 80 00 – PERFORMANCE REQUIREMENTS

PART 1 - GENERAL

1.1 INTERPRETATION:

A. The following paragraphs contain requirements that apply to the overall accomplishment of the work. Where specified action is required by this section, it is the contractor's responsibility to perform or to assign such requirement to subcontractor and see that it is performed.

1.2 RELATIONSHIP BETWEEN TRADES:

A. Require and be responsible for cooperation and coordination between various trades and subcontractors whose work is dependent upon one another. Schedule such work so as to prevent delays in dependent work and so that all related work will progress together. Fully inform each trade or subcontractor of the relation of his work to other work and require each to make necessary provisions for the requirements of such other work. No additional compensation for extra work incurred through the lack of cooperation and coordination between various trades and subcontractors will be allowed.

1.3 PROTECTION:

A. Assume the responsibility for initiation and maintenance of protective requirements required including 6' chain link construction fence securing the entire construction site, warning signs, barricades at open trench and warnings per USHA open trench requirements, training, and safety program with assigned safety coordinator on-site.

1.4 REPAIR OF DAMAGE:

A. Assume responsibility for any loss or damage caused by these operations or any trade to the work, or to materials, to adjacent property and existing structures and to persons, and make good any loss, damage, or injury without cost to owner.

1.5 SECURITY:

A. Conform to requirements of public laws, ordinances and regulations and the requirements of insurance carriers concerning security to the site while work is in progress as well as when it has been suspended. Contractors are encouraged to provide temporary pole mounted security lighting during construction.

1.6 DOCUMENTS AT THE SITE:

A. Maintain at the site, one reference copy of each approved shop drawing and of each drawing, specification, addenda, revision, and other modification, in good order and marked by note to record each change made during construction on record prints. Drawings shall be clearly marked "RECORD PRINTS" and not used for construction purposes. Mechanical Record Drawings shall show actual CFM rating in each space. At the time of pre-final inspection, submit the record prints to the Architect. Also obtain, when directed or as necessary to properly execute the work, copies of literature, standards and other data referred to but not included in the specifications.

B. The record prints will be checked periodically by the Architect to determine that they are current. A certificate for payment will not be issued until record prints are made current as determined by the Architect.

C. Refer to Section 01 78 39 for additional record drawings requirements.

1.7 CONSTRUCTION LOADING:

A. Concrete slabs on grade, unless designated otherwise on the drawings, have not been designed for heavy loading. Do not subject such slabs on grade to excessive loading by shoring, storage of

materials or operation of construction equipment unless adequately protected by planking. Maintenance of slabs in good condition is the responsibility of the Contractor, who shall remove all damaged areas of such slabs and replace them with new work at no cost to owner.

1.8 EXISTING UTILITIES:

A. Shut-downs for utility tie-ins shall be scheduled in order to minimize inconvenience to the owner. The contractor shall notify the owner and Architect in writing 10 days in advance of any anticipated shut-down. The Contractor provides adequate manpower on hand to assure that tie-ins can be completed on schedule. The shut-down shall be scheduled with the agreement of the owner and the contractor.

1.9 CONSTRUCTION SCHEDULING:

A. The work shall be conducted in such a way as to cause a minimum of interference with the owner's use of existing facilities during normal working hours.
B. Scheduling of work and access to site will be discussed during the Preconstruction Conference.

1.10 PROJECT OFFICE FACILITY:

A. Contractor to provide secured environmentally conditioned project office with table, chairs, and rack for maintenance of the as-built drawings.
B. Contractor is encouraged to consider use of video security devices is issues of security become a consideration during the course of the construction.

END OF SECTION

SECTION 12 41 13 – SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 This Section requires the selective removal and subsequent off-site disposal of the following:
- A. Portions of existing drive and other miscellaneous concrete.
- B. Existing trees noted on site plan to be removed including grubbing roots.

1.2 RELATED WORK SPECIFIED ELSEWHERE:
- A. Excavation of dirt for new foundation and new pavement.
- B. Construction of new concrete pavement.
- C. Construction of new building.
- D. Removal of items noted on site demolition, civil and MEP plans and as required to complete the new construction as indicated on the drawings.
- E. Contractors are reminded to visit site to verify any conditions to assure all scope of demolition work is included in this proposal.

1.3 SCHEDULE:
- A. Submit schedule indicating proposed sequence of operations for selective demolition work to Architect for review prior to start of work.
- B. Reference drawings for phasing of work and coordinate with Owner for continuous access by the general public to existing facilities throughout the course of construction.

1.4 CONDITION OF STRUCTURES:
- A. Owner assumes no responsibility for actual condition of items or structures to be demolished and contractor assumes responsibility to have inspected all existing facilities to become fully acquainted with conditions and materials.
- B. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

1.5 PARTIAL DEMOLITION AND REMOVAL:
- A. Reference drawings for selective demolition.
- B. Note: Contractor shall be responsible to survey existing conditions and shall replace any existing construction damaged during the course of demolition and construction.
- C. Reference mechanical and electrical for demolition required for access and running of new services and lines. Repair to original condition.

1.6 PROTECTIONS:
- A. Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
- B. Protect from damaging existing finish work that is to remain in place. Protect floors.
- C. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to owner.

1.7 TRAFFIC:
- A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1.8 ENVIRONMENTAL CONTROLS:
- A. Use water sprinkling, temporary enclosures, and owner suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
C. The General Contractor will provide soil barriers as required by TNRCC around the perimeter of the site.

1.9 INTERIM LIFE SAFETY MEASURES

A. General contractor must provide continuous life safety passage from the end of the existing building as required by the International Building Code which includes temporary fencing to permit, in the case of an emergency evacuation of the building, the clear width egress from the building. Contractor may wish to schedule the final connection between the two structures until school is out for the summer to avoid any issues related to this requirement.
B. General contractor must coordinate with the school district any required interruption of egress so as to not have students present in the affected wing of the existing building.

PART 2 - EXECUTION

2.1 INSPECTION:

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions of structure surfaces, equipment, or surrounding properties that could be misconstrued as damage resulting from selective demolition work; file with Owner's representative prior to starting work.

2.2 PREPARATION:

A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.
B. Cease operations and notify Owner's representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
C. Provide weatherproof closures for exterior openings resulting from demolition work.
D. Locate, identify stub off, and disconnect utility services that are not indicated to remain.

2.3 DEMOLITION:

A. Perform selective demolition work in a systematic manner.
B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
D. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

2.4 SALVAGE ITEMS:

A. Where indicated on Drawings as "Salvage - Deliver to Owner": carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.

2.5 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose off site.
B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
C. It is the responsibility of the General Contractor to cover all disposal charges including charges at municipal facilities.

2.6 CLEANUP AND REPAIR:

A. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structure Demolition:
1. Demolition of designated building structures.
2. Demolition of designated site improvements including paving, curbing, site walls, and utility structures.
3. Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
4. Removal of hollow items or items which could collapse.
5. Salvage of designated items.
6. Protection of site work and adjacent structures.
7. Disconnection, capping, and removal of utilities.
8. Pollution control during building demolition, including noise control.
9. Removal and legal disposal of materials.
10. Protection of designated site improvements and adjacent construction,
11. Interruption, capping or removal of utilities as applicable.

B. Hazardous Materials:
1. Not present.
2. Removed under separate prior contract.
3. Removed as a part of this contract.

1.2 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Schedule: Submit for approval demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

1.3 QUALITY ASSURANCE

A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

1.4 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.5 SEQUENCING

A. Immediate areas of work will not be occupied during demolition. The public, including children, may occupy adjacent areas.

B. No responsibility for buildings and structures to be demolished will be assumed by the Owner.

C. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS - Not applicable to this Section

PART 3 EXECUTION

3.1 STRUCTURE DEMOLITION

A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.

B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.

C. Shoring and Bracing: Provide and maintain interior and exterior shoring and bracing.

D. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

E. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

F. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.

3.2 SCHEDULE

A. Items for Protection During Demolition: (The following are samples only)
   1. [Designated site improvements, trees, and plantings.]
   2. [Adjacent construction.]

B. Items to be Salvaged for Reinstallation:
   1. [Handrails.]
   2. [Wood trim.]
   3. [Light fixtures.]

C. Items to be Salvaged for Delivery to Owner:
   1. [Doors and hardware.]
   2. [Toilet accessories.]
   3. [Light fixtures.]
   4. [Plumbing fixtures.]
   5. [Radiators]
   6. [Decorative elements.]

D. Utilities Requiring Interruption, Capping, or Removal:
   1. [Electric.]
   2. [Heat.]
   3. [Water.]
   4. [Gas.]
   5. [Sewerage.]
   6. [Steam.]
   7. [Cable television.]

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective Site Demolition:
1. Demolition of designated site improvements including paving, curbing, site walls, and utility structures.
2. Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
3. Removal of hollow items or items which could collapse.
4. Salvage of designated items.
5. Protection of site work and adjacent structures.
6. Disconnection, capping, and removal of utilities.
7. Pollution control during building demolition, including noise control.
8. Removal and legal disposal of materials.
9. Designated site improvements and adjacent construction.
10. Interruption, capping or removal of utilities as applicable.

B. Selective Building Demolition:
1. Selective demolition of interior partitions, systems, and building components designated to be removed.
2. Selective demolition of exterior facade, structures, and components designated to be removed.
3. Protection of portions of building adjacent to or affected by selective demolition.
4. Removal of abandoned utilities and wiring systems.
5. Notification to Owner of schedule of shut-off of utilities which serve occupied spaces.
6. Pollution control during selective demolition, including noise control.
7. Removal and legal disposal of materials.
8. Protection of designated site improvements and adjacent construction.
9. Salvage of designated items.
10. Interruption, capping or removal of utilities as applicable.

C. Hazardous Materials:
1. Not present.
2. Removed under separate prior contract.
3. Removed as a part of this contract.

1.2 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Schedule: Submit for approval selective demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

1.3 QUALITY ASSURANCE

A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

1.4 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.5 SEQUENCING

A. Immediate areas of work will not be occupied during selective demolition. The public, including children, may occupy adjacent areas.

B. No responsibility for buildings and structures to be demolished will be assumed by the Owner.

C. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS - Not applicable to this Section.

PART 3 EXECUTION

3.1 SELECTIVE DEMOLITION

A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.

B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.

C. Shoring and Bracing: Provide and maintain interior and exterior shoring and bracing.

D. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

E. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

F. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.

G. Restoration: Restore finishes of patched areas.

3.2 SCHEDULE

A. Items for Protection During Demolition and Construction: (The following are samples only)
   1. [Designated site improvements, trees, and plantings.]
   2. [Adjacent construction.]

B. Items to be Salvaged for Reinstallation:
   1. [Handrails.]
   2. [Wood trim.]
   3. [Light fixtures.]

C. Items to be Salvaged for Delivery to Owner:
   1. [Doors and hardware.]
   2. [Toilet accessories.]
   3. [Light fixtures.]
   4. [Plumbing fixtures.]
   5. [Radiators]
   6. [Decorative elements.]

D. Utilities Requiring Interruption, Capping, or Removal:

1. [Electric.]
2. [Heat.]
3. [Water.]
4. [Gas.]
5. [Sewerage.]
6. [Steam.]
7. [Cable television.]

END OF SECTION

SECTION 03 11 00 – CONCRETE FORMING

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:
- A. Submittal Procedures: Section 01 33 00
- B. Concrete Paving: Section 32 13 13
- C. Cast-in-Place Concrete: Section 03 30 00

1.2 REFERENCES:
- A. ACI 301, Specifications for Structural Concrete for Buildings.
- B. ACI 318, Building Code Requirements for Reinforced Concrete.
- C. ACI 347, Recommended Practice for Concrete Formwork.
- D. APA, Plywood Product Standard Handbook, (U.S. Product Standard PS-1, Construction and Industrial Plywood.)
- E. Structural Drawings: Coordinate structural requirements with requirements of this Section.

1.3 SYSTEM DESCRIPTION:
- A. Design, engineer, and construct formwork, shoring, and bracing to meet project requirements so that resultant concrete conforms to required shapes, lines, dimensions, and finishes.

1.4 QUALITY ASSURANCE:
- A. Construct and erect formwork in accordance with ACI 301, and with applicable referenced portions of ACI 347.

PART 2 – PRODUCTS

2.1 CONTACT SURFACE FORM MATERIALS:
- A. Wood Sheathing: Surface free of loose knots; contact surfaces dressed to uniform texture on edges and surfaces for tight fit; 5/8 inch minimum thickness for plywood.
- B. Wood Sheathing - Exposed Concrete: APA B-B (Concrete Form) Plyform, Class I, Exterior Grade, mil oiled and edge sealed, thickness to withstand pressure of plastic concrete without bow or deflection; use largest possible sizes to minimize joints.
- C. Carton Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

2.2 FORM ACCESSORY MATERIALS:
- A. Form Ties: Snap-off type metal ties of length required for form thickness; 1 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches in concrete surface, with waterproofing washer.
- B. Form Release Agent: Clear liquid consisting of 100% wood fats that will not cause staining, discoloration, or texturing of concrete, prevent proper bonding of subsequently applied coatings, or leave a waxy or oily residue.
- C. Chamfer Strips: Triangular wood, or vinyl, (surfaced 3 sides if wood), 3/4 inch sides unless indicated otherwise.
- D. Construction Joint Forms: Prefabricated galvanized steel, tongue and shape, complete with stakes.

2.3 FORM FABRICATION:
- A. Design and construct forms within tolerances defined in ACI 301.
- B. Design forms to withstand concrete and placement loads without deformation beyond 1/480 of span.
- C. Construct joints tightly to eliminate leakage of mortar; minimize occurrence of joints.
- D. Provide temporary ports to facilitate cleaning and inspection.

E. Arrange and assemble formwork to permit dismantling and stripping without damage to concrete.
F. For exposed surfaces, design formwork to permit stripping without removing principal shores.

PART 3 – EXECUTION

3.1 PREPARATION:
A. Provide formed openings where required for Work to be embedded in and pass through concrete members.
B. Coordinate Work of other Sections requiring the forming and setting of openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
C. Install carton forms in accordance with form manufacturer's recommendations; protect from moisture before concrete placing; protect from crushing during concrete placement.
D. Irregularities Permitted in Formed Surfaces: Class C, ACI 347.

3.2 FORM ERECTION:
A. Strengthen formwork liable to be overstressed by placement of plastic concrete.
B. Brace and tie forms together to maintain accurate position and shape during concrete placement.

3.3 PLACEMENT OF FORMWORK ACCESSORIES:
A. Install accessories securely and in accordance with accessory manufacturer's recommendations to prevent displacement during concrete placement.
B. Chamfer Locations: Exterior corners of beams, columns and as indicated.
C. Form Release Agency: Apply before placing reinforcing steel, anchoring devices, and embedded items, in accordance with manufacturer's written instructions.

3.4 FORM REMOVAL:
A. Remove forms, shores, and bracing when concrete test results indicate sufficient strength to carry construction and design loads, and its own weight.
B. Remove formwork progressively in accordance with ACI requirements to prevent shock loads and unbalanced loading of structure.
C. Loosen forms carefully without wedging tools against concrete surfaces.
D. Remove forms not directly supporting weight of concrete as soon as stripping operations will not damage concrete.

END OF SECTION

E. Arrange and assemble formwork to permit dismantling and stripping without damage to concrete.
F. For exposed surfaces, design formwork to permit stripping without removing principal shores.

PART 3 – EXECUTION

3.1 PREPARATION:
A. Provide formed openings where required for Work to be embedded in and pass through concrete members.
B. Coordinate Work of other Sections requiring the forming and setting of openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
C. Install carton forms in accordance with form manufacturer's recommendations; protect from moisture before concrete placing; protect from crushing during concrete placement.
D. Irregularities Permitted in Formed Surfaces: Class C, ACI 347.

3.2 FORM ERECTION:
A. Strengthen formwork liable to be overstressed by placement of plastic concrete.
B. Brace and tie forms together to maintain accurate position and shape during concrete placement.

3.3 PLACEMENT OF FORMWORK ACCESSORIES:
A. Install accessories securely and in accordance with accessory manufacturer's recommendations to prevent displacement during concrete placement.
B. Chamfer Locations: Exterior corners of beams, columns and as indicated.
C. Form Release Agency: Apply before placing reinforcing steel, anchoring devices, and embedded items, in accordance with manufacturer's written instructions.

3.4 FORM REMOVAL:
A. Remove forms, shores, and bracing when concrete test results indicate sufficient strength to carry construction and design loads, and its own weight.
B. Remove formwork progressively in accordance with ACI requirements to prevent shock loads and unbalanced loading of structure.
C. Loosen forms carefully without wedging tools against concrete surfaces.
D. Remove forms not directly supporting weight of concrete as soon as stripping operations will not damage concrete.

END OF SECTION

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Submittal Procedures: Section 01 33 00
B. Concrete Paving: Section 32 13 13
C. Cast-in-Place Concrete: Section 03 30 00
D. Concrete Unit Masonry: Section 04 22 00

1.2 REFERENCES:

A. ACI 301, Specifications for Structural Concrete for Buildings.
B. ACI 315, Details and Detailing of Concrete Reinforcement.
C. ACI 318, Building Code Requirements for Reinforced Concrete.
D. ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
E. ASTM A 185, Welded Steel Wire Fabric for Concrete Reinforcement.
F. AWS D1.4, Recommended Practice for Welding Reinforcement Steel, Metal Inserts, and Connections in Reinforced Concrete Construction.
G. CRSI 63, Recommended Practice for Placing Reinforcing Bars.
H. CRSI 65, Recommended Practice for Placing Bar Supports, Specification and Nomenclature.
I. Structural Drawings: Coordinate structural requirements with requirements of this Section.

1.3 SUBMITTALS:

A. Shop Drawings: Indicate layout, sizes, bends, spacing and supports.
B. Mill Reports: Manufacturer's certificate describing steel used.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Bars: ASTM A 615, grade 60.
B. Ties: 16-gage annealed wire or clip system.
C. Chairs: Steel chairs with sand pads (plastic not allowed)

2.2 2.02 FABRICATION:

A. Cut and bend bars cold in compliance with ACI 315.
B. Provide sand plates or horizontal runners at chairs for slabs on grade where base material will not support chair legs.

PART 3 – EXECUTION

3.1 PLACEMENT:

A. Comply with CRS1 63 and 65 and ACI 301 Chapter 5.
B. Place reinforcing after forms have been coated with release agent.
C. Place reinforcing supported and secured against displacement, without deviation from true alignment.
D. Place clean, reinforcing free of loose scale, dirt, and other foreign coatings which would reduce bond to concrete.
E. Place cast-in-place items for work of other Sections; support and secure against displacement.
F. Set bar ties so wire is embedded in concrete.

END OF SECTION

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Submittal Procedures: Section 01 33 00
B. Concrete Paving: Section 32 13 13
C. Cast-in-Place Concrete: Section 03 30 00
D. Concrete Unit Masonry: Section 04 22 00

1.2 REFERENCES:

A. ACI 301, Specifications for Structural Concrete for Buildings.
B. ACI 315, Details and Detailing of Concrete Reinforcement.
C. ACI 318, Building Code Requirements for Reinforced Concrete.
D. ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
E. ASTM A 185, Welded Steel Wire Fabric for Concrete Reinforcement.
F. AWS D1.4, Recommended Practice for Welding Reinforcement Steel, Metal Inserts, and Connections in Reinforced Concrete Construction.
G. CRSI 63, Recommended Practice for Placing Reinforcing Bars.
H. CRSI 65, Recommended Practice for Placing Bar Supports, Specification and Nomenclature.
I. Structural Drawings: Coordinate structural requirements with requirements of this Section.

1.3 SUBMITTALS:

A. Shop Drawings: Indicate layout, sizes, bends, spacing and supports.
B. Mill Reports: Manufacturer's certificate describing steel used.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Bars: ASTM A 615, grade 60.
B. Ties: 16-gage annealed wire or clip system.
C. Chairs: Steel chairs with sand pads (plastic not allowed)

2.2 2.02 FABRICATION:

A. Cut and bend bars cold in compliance with ACI 315.
B. Provide sand plates or horizontal runners at chairs for slabs on grade where base material will not support chair legs.

PART 3 – EXECUTION

3.1 PLACEMENT:

A. Comply with CRS1 63 and 65 and ACI 301 Chapter 5.
B. Place reinforcing after forms have been coated with release agent.
C. Place reinforcing supported and secured against displacement, without deviation from true alignment.
D. Place clean, reinforcing free of loose scale, dirt, and other foreign coatings which would reduce bond to concrete.
E. Place cast-in-place items for work of other Sections; support and secure against displacement.
F. Set bar ties so wire is embedded in concrete.

END OF SECTION

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions, Supplementary General Conditions, and other Division 1 Project Manual Sections, apply to work of this Section.

A. Section 01 33 00 - Submittal Procedures
B. Section 01 45 29 - Testing Laboratory Services
C. Section 32 13 13 - Concrete Paving
D. Section 03 11 00 - Concrete Form Work
E. Section 03 35 00 - Concrete Finishing
F. Section 07 92 00 - Joint Sealants

1.2 SUMMARY

A. This Section includes cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.3 Cast-in-place concrete includes the following:

A. Foundations and footings.
B. Slabs-on-grade.
C. Foundation walls.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Project Manual.
B. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.
C. Laboratory test reports for concrete materials and mix design test.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
    1. American Concrete Institute (ACI 301, "Specifications for Structural Concrete for Buildings."
    2. American Concrete institute (ACI 304, “Recommended Practice for Measuring, Mixing, Transporting and Placing concrete”
    3. ACI 318, "Building Code Requirements for Reinforced Concrete."
    4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
    5. ASTM C 33, C94, C 150 and C260
    6. ASTM C494 Type F for high range water reducer
B. Concrete Testing Service: (Reference Section 01410 – Testing Laboratory Services Under Separate Contract with Owner)
C. Quality Control Testing During Construction: General Contractor will coordinate with the Owner’s selected testing laboratory to perform tests.
D. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS (All materials in compliance with laboratory mix standards)

A. Portland cement: ASTM C 150, Type I.
   1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
   1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
   2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

C. Lightweight Aggregates: ASTM C 330.
D. Water: Potable.
E. Admixtures, General: Provide concrete admixtures that contain no more than 0.1 percent chloride ions.
F. Air-Entraining Admixture for exterior exposed concrete only: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
G. Water-Reducing Admixture: ASTM C 494, Type A.
H. High-Range Water-Reducing Admixture All Building Slab Concrete: ASTM C 494, Type F.
I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
K. Fly Ash: Max 15% by weight.

2.2 RELATED MATERIALS
A. Sand Cushion: Clean, manufactured, or natural sand.
B. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:
   1. Reference Section 07190 for required vapor barrier, tape, and strict installation guideline.

2.3 Moisture-Retaining Cover: One of the following, complying with ASTM C 171, for use on interior slab.
   1. Waterproof paper.
   2. Polyethylene film.
   3. Polyethylene-coated burlap.

2.4 Bonding Agent: Polyvinyl acetate or acrylic base.
2.5 Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

2.6 PROPORTIONING AND DESIGNING MIXES
A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
C. Design mixes to provide normal weight concrete with properties as indicated on drawings and schedules:
D. Water-Cement Ratios: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
   1. Footings and beams 0.53 water/cement ratio.

2. Building slab 0.45 using ASTM C494 Type F High Range Water Reducer 0.57. Water cannot be added to this mix on site without the testing laboratory's representative recommendation for each situation.

E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
   1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
   2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
   3. Concrete containing high-range water-reducing admixture (super plasticizer): No more than 8 inches after adding admixture to site-verified 2-to-3 inch slump concrete. Water must not be added on site without laboratory's site representative recommendation for each case.
   4. Other concrete: Not more than 4 inches.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

G. ADMIXTURES
   1. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
   2. Air entrainment not allowed in building slab.
   3. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
   1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes. Use caution in adding water beyond the design mix requirements outlined by the testing laboratory. This caution is to prevent future water issues related to moisture emissions at slab surface preventing adhesion for floor finishes. The Job Superintendent shall take great care to prevent and control concrete suppliers from adding non-calculated water to mix.

PART 3 – EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, continuous specified vapor retarder/barrier, taped sealants at pipe penetrations through membrane and other related materials with placement of forms and reinforcing steel.
B. The general contractor must schedule a pre-concrete pour conference with sports flooring supplier/installer to coordinate requirements of slab preparation and protection. Coordinate with the Architect and concrete contractor to establish control joint pattern acceptable to all parties involved.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of

correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, shrinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER/BARRIER INSTALLATION

A. General: Place vapor retarder/barrier sheeting in strict compliance with manufacturer's requirements including lapping, taping of seams, extending under beams, sealants required to bond to outer beam surfaces and special taping/sealants required at pipe and electrical penetrations through vapor barrier membrane.
B. Lap joints 6 inches and seal with manufacturers recommended mastic or pressure-sensitive tape.
C. Reference Drawings for special instructions related to extending membrane under beams.

3.4 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as noted.
   1. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.
D. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction. Support reinforcing rods and fabric with metal (plastic not accepted) that will properly distribute the load over the sand base and vapor barrier membrane.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
E. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.6 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached. Protect embedded items during the pour and finishing of concrete surface including re-checking dimensions for compliance with drawings.
B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.
B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

3.8 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. All formwork, reinforcing and vapor barrier installations must be viewed and approved by structural engineer and viewed by architect before delivery of concrete begins.
B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as noted.
C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as shown. Deposit concrete to avoid segregation at its final location.
D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
    1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
    2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrator to rapidly penetrate placed layer and at least 6 inches into

preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
   1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
   2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
   3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as noted.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
   3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
   4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

3.10 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
   1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as noted; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
   1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible t power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system. Caution: Do not over-trowel concrete surface to an extra fine surface to avoid sealing the actual finish surface and trapping water from being released during the watering-hydration process. Contractor must consult with the provider of floor finishes to assure compliance with finish surface to guarantee release of concrete moisture and acceptance of adhesive materials to be utilized in the floor finish process. In some cases, certain floor finishes might require the application of light broom finish over surface for proper adhesive application and bonding.
   1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Dry dusting slab surface with powdered cement will not be permitted by contractor.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work or other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to

template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Where indicated on drawings, provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitted, keep slab surface continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by moist curing, by moisture-retaining cover curing, or by combining these methods, as noted. The use of sprayed liquid curing compounds will not be permitted on this project.

D. Provide moisture curing by the following methods. Keep concrete surface continuously wet by covering with water. Use continuous water-fog spray. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.

E. Provide moisture-retaining cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Curing compounds used for sidewalks and drives: Membrane Forming Liquid: “Kure-N-Seal” by Sonneborn is specified; “Clear Seal” by A.C. Horn, and “J-20 Acrylic Cure" by Dayton Superior are acceptable or approved equal.

3.13 Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods noted above, as applicable.

3.14 Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

A. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.15 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as noted.

B. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

C. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete had attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.16 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimen representative of concrete location or members.
C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.17 REUSING FORMS

A. Clean and repair surfaces for forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.18 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.
B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
C. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
    1. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

D. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
    1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct slow and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
    1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, pop outs, honeycombs, rock pockets, and other objectionable conditions.
    2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
    3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching

mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish blending with adjacent finished concrete. Cure in same manner as adjacent concrete.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.19 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: (Reference 01410 for Testing – Testing Laboratory Services by Owner Under Separate Contract.)

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
   a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one set for each day's placement exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test results falls below indicated compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix

proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Additional Tests: The testing agency shall make additional tests of in-place concrete when test results indicate noted concrete strengths and other characteristics have not been attained in the structure, at directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

SECTION 03 35 00 – CONCRETE SEALERS

PART I – GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, apply to this section.

1.2 SUMMARY
- A. Section includes furnishings and applying sealer on interior exposed concrete where indicated on Drawings

1.3 RELATED SECTIONS
- A. Coordinate Work of Section with work of other sections, including Division 01 Sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 REFERENCE STANDARDS
- A. American Association of State Highway and Transportation Officials (AASHTO)
  1. M 148, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

- B. ASTM International (ASTM)
  1. C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  2. C 1315, Standard Specification for Liquid Membrane-Forming Compounds having Special Properties for Curing and Sealing Concrete

1.5 SUBMITTALS
- A. Product Data: Provide manufacturer's product data describing materials, recommended application procedures and coverage rates
- B. Certificates: Material certificates signed by manufacturer certifying that concrete floor sealer complies with requirements specified herein

1.6 QUALITY ASSURANCE
- A. Single Source Responsibility: Obtain materials from a single source manufacturer.
- B. Installed Qualifications: Experienced installer or applicator specialized in applying floor sealers of type similar to that required for this Project and who is acceptable to manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING
- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.8 PROJECT CONDITIONS
- A. Environmental Conditions: Comply with manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required executing and protecting work.

PART II - PRODUCTS

2.1 APPROVED PRODUCTS/MANUFACTURERS

A. Specification are based on Sealtight VOCOMP-30 Water-based, Acrylic, Concrete Curing and Sealing Compound manufactured by W.R. Meadows, Inc. or Architect approved equal. Other manufacturers must have a minimum of 5 years experience manufacturing products meeting or exceeding the specifications and comply with Section 01 60 00 requirements regarding substitutions to be considered.

2.2 DESCRIPTIONS

A. Ready-to-use 30% solids concrete curing and sealing compound formulated of special acrylic polymers in a true water-based carrier
B. Provides improved resistance to rain, sun, freezing temperatures, most acids and industrial chemicals, petroleum, deicing salts, cleaning agents (except aromatic solvents) diluted caustics and other pollutants.

2.3 FEATURES AND BENEFITS

A. Provide ready-to-use, non-yellowing, water-based compound that seals and protects concrete in one quick easy application
B. Dries quickly on new concrete to provide a clear, tough, easy –to-clean sheen finish
C. Applicable for use on new, old, interior, exterior, horizontal and vertical concrete surfaces.
D. Offers improved resistance to most chemicals, petroleum, abrasives, and mortar droppings.
E. Application tools can be cleaned with soap and water.
F. VOC compliant: Actual VOC content is < 50g/L

2.4 PACKAGING

A. Available in 1 and 5 pails for 55 gallon drums as required

2.5 COVERAGE

A. Broomed Surface: Approximately 300 ft²/gal
B. Troweled Surface: Approximately 500 ft²/gal

PART III – EXECUTION

3.1 PREPARATION

A. Surface preparation is extremely important. Concrete must always be clean and dry with all stains, oil, grease, dust, and dirt removed prior to application. If not, they will be amplified by the transparent sheen finish. CAUTION: If a liquid compound other than the one specified has been used, do not apply specified sealer until all traces of the compound have been completely removed and the surface is clean and dry. Apply sealer when the surface water has disappeared, and the concrete surface will not be marred by walking workmen.

3.2 MIXING

A. Mix in accordance with manufacturer's instructions. For optimum performance, gentle mixing or agitation is recommended.
CAUTION: TO AVOID FOAMING, DO NOT MIX EXCESSIVELY.

3.3 APPLICATION

A. Apply 2 coats at right angles in accordance with manufacturer's instructions using an industrial sprayer, such as Chapin 5916 tip that produces a flow of 1 gallon per minute or a sealer can also be applied using a lint-free roller or lambs wool applicator. Care should be taken to maintain wet-edge during application to prevent roller marks in dried film.
B. Spray on in a fine, fog pattern without spurts and dribbles to form a thin, continuous film. AVOID PUDDLING in low areas. If puddles occur, brush or roll them out. For added protection and a greater sheen on new or existing (old) concrete.

C. Additional coats of sealer may be applied after the first coat has thoroughly dried. Use of improper spray tip or application method may result in a “spotty” appearance and may not be accepted until corrected.

3.4 DRYING TIME

A. Sealer dries quickly. Drying times may be extended depending on application rate, temperature, humidity, and project conditions.

3.5 CLEANUP AND PROTECTION

A. While sealer is still wet, equipment may be cleaned with soap and water. Once dried, the material may be removed with solvent such as Xylene and Toluene.
B. Restrict foot traffic for at least 4 hours. 12 hours if preferable.
C. Clean sealed concrete floor just prior to Owner acceptance

END OF SECTION

SECTION 04 05 13 – MASONRY MORTARING AND GROUTING

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, apply to this section.

1.2 SUMMARY

A. Section includes mortar and grout used at all masonry work

B. It is the intent that work of the Section be performed by Contractor performing work of Section 04 20 00 - Unit Masonry

1.3 RELATED SECTIONS

A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated

B. Samples for Initial Selection: For the following:

1. Colored mortar

C. Samples for Verification: For each type and color of the following:

1. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

D. Qualification Data: For testing agency

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturer's product names, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.

F. Materials Certificates: Include statements of materials properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Cementituous materials. Include brand, type, and name of manufacturer.
2. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
3. Grout mixes. Include description of type and proportions of ingredients.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specifications
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide a statement of net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold0weather requirements.

1.5 QUALITY ASSURANCE

A. This section outlines only minimum standards and requirements. Refer to the Drawings, and other sections of the specifications for additional requirements. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies and clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementituous component and from one source or producer for each aggregate.

D. Contractor to provide a sample brick panel of at least 100 face brick to be laid up with specified jointing for approval by Owner. A sample panel must be provided for each pattern. Condition.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 “Project Management and Coordination”.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store cementituous materials on elevated platforms, under cover, and in dry location. Do not use cementituous materials that have become damp

B. Store aggregates where grading and other required characteristics can be maintained, and contamination be avoided.

C. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do no use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damage by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

PART II - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Cements:

1. Masonry Cement: Shall not be used.
2. Portland Cement: ASTM C150 Type I, gray or white color as required to produce mortar colored indicated.

B. Admixture: Setting accelerators or antifreeze compounds are not permitted.

C. Masonry Aggregate: ASTM 144, standard masonry type.

D. Grout Aggregate: ASTM C404, fine and coarse.

E. Water: Fresh, clean, and free from acid, alkalis, sewage, or organic matter.

F. Hydrated Lime: ASTM C206, Type S

G. Mortar Color: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

1. Approved Manufacturers: One (1) of the following or Architect approved equal.

(a) “SGS Mortar Color”: Solomon Colors, Inc.
(b) “True Tone Mortar Colors”: Davis Colors

2. Color shall be as selected by the Owner and Architect from manufacturer’s full range.

H. Integral Water Repellant Agent: One (1) of the following or Architect approved equal.

1. “Dry-Block Mortar Admixture”: W.R. Grace & Co.
2. “RainBloc for Mortar”: ACM Chemistries, Inc.
3. “Krete Gard Mortar Mix”; Krete Industries, Inc.
4. “Rheopel Plus Mortar Admixture.”: BASF Master Builders.

I. Mortar Mixes for CMU Walls: ASTM C270, Type S using proportion specification.

J. Mortar for Face Brick: Type N using proportion specification

2.2 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementituous materials in mortar, including that for exterior and reinforced masonry, to Portland cement, aggregate, and lime.

B. Grout for Unit Masonry: Comply with ASTM 476

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimension of grout spaces and pour height.
2. Provide grout with a slump of 8” to 11” as measured according to ASTM C143

PART III – EXECUTION

3.1 MIXING

A. Thoroughly mix mortar ingredients in strict accordance with admixture manufacturer’s specifications and in accordance with ASTM C270

B. Mix only sufficient mortar to supply immediate requirements.

C. Mix by mechanical means, if possible

D. Keep proportion constant

E. Achieve uniformly damp sand immediately before mixing process.

F. Add mortar color to achieve uniformity of mix and colorant. Limit mineral-oxide pigments to no more than 10% of cement content by weight

G. Add water repellent admixture to mortar used for bedding decorative concrete masonry units containing integral water repellent.

H. Re-temper only within 2 hours of mixing

3.2 INSTALLATION

A. Install mortar and grout in accordance with Section 04 20 00 “Unit Masonry”

B. Lay hollow concrete masonry units (CMU) as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

C. Lay solid masonry units with completely filled bed and head joints butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints

D. Low-Lift Grouting:

1. Use Low-Lift grouting techniques for all walls and bond beams.
2. Provide minimum clear dimension of 2” and clear area of 8 in^2 in vertical cores to be grouted.
3. Place vertical reinforcement prior to laying CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10’-0”.
4. Place horizontal beam reinforcement as the masonry units are laid.
5. Lay CMU to maximum pour height. Do not exceed 5’ height, or if bond beam occurs below 5’ height stop pour at course below bond beam.
6. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than 1 hour. Terminate grout pours 1½” below top course of pour/
7. Bond Beams: Stop grout in vertical cells 1½” below bond beam course. Place horizontal reinforcing in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

3.3 FIELD QUALITY CONTROL

A. Comply with Section 01 40 00 – Quality Requirements for field inspecting and testing.

B. Testing Frequency:

1. 1 set of prism tests for every 5,000 ft^2 of completed wall area.

2. 1 set of mortar tests in accordance with ASTM C780 for aggregate ratio and water content, consistency, and compressive strength, for every 25 yds^3 Mortar

3. 1 set of grout tests in accordance with ASTM C780 for compressive strength and slump, for every 25 yds^3 grout.

3.4 REPAIRING AND POINTING

A. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

END OF SECTION

SECTION 04 05 23 – MASONRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A.	Submittal Procedures	Section 01 33 00
B.	Reinforcing Steel	Section 03 21 00
C.	Unit Masonry	Section 04 20 00
D.	Joint Sealant	Section 07 92 00

1.2 REFERENCES

A. ASTM A 123, Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
B. ASTM A 153, Zinc Coating (Hot Dip) on Iron and Steel Hardware.
C. ASTM A 641, Zinc Coated (Galvanized) Carbon Steel Wire.
D. ASTM D 1227, Emulsified Asphalt.

1.3 SUBMITTALS:

A. Product Data: Manufacturer's descriptive data for each accessory.
Manufacturer's technical data on flashing and adhesives.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:
A. Hohmann & Barnard Inc. (HB) is specified unless noted otherwise.

2.2 CMU HORIZONTAL REINFORCING:
A. Type: 120 Truss-Mesh reinforcing
B. Wire Material: Min. 9 ga. plain steel wire side rods and cross rods, zinc-coated ASTM A 641, class 3 - .90 ounces per square foot.
C. Fabrication: Allow for maximum joint misalignment of 1-1/2 inches.
D. Manufacturer and Type: HB or approved equal.
E. Final Finish: Hot dip galvanized entire assembly after fabrication ASTM A 153, 1.5 ounces per square foot.
F. Standard Weight or better as required by Code

2.3 ADJUSTABLE VENEER ANCHOR
A. Type: X-Seal Anchor System with Byna-Lok Wire Ties
B. Material: Hot dipped galvanized
C. Manufacturer and Type: HB X-Seal veneer anchors, 1-1/2" legs, hot dipped galv. 3/16" Vee-Byna Ties (VBT)
D. Finish: Hot Dipped Galvanized

2.4 SEAL TAPE:
A. X-Seal Tape, 40 mil self adhesive backed
B. 3" wide seal tape installed between X-Seal anchors and rigid insulation.

C. 1-1/2” rigid closed cell cavity wall insulation

2.5 FLASHING:
A. Material: Epra-Max 40 mil EPDM thru wall flashing or Architect approved equal, below brick sills and brick ledge and as noted on drawings and details.
B. Adhesive: Manufacturer’s standard for bonding material to itself.
C. Mastic: Asphalt base plastic roofing cement.
D. Approved Equal: Nervestral HD 40 mil

2.6 TERMINATION BAR:
A. Hohmann & Barnard Termination Bar

2.7 S.S. SLIP-SET STABILIZER:
A. SLIP-SET stabilizer
B. Stainless Steel Type 304

2.8 DAMP-PROOFING AIR BARRIER:
A. Bituminous Damp-proofing
B. Reference 07 11 13

2.9 CAVITY INSULATION:
A. Foil faced 1-1/2” rigid closed cell cavity wall insulation
B. R-9.8

2.10 FLASHING:
A. Material: EPDM synthetic rubber 40 mil
B. Epra-Max EPDM thru wall flashing or Architect approved equal, below brick sills and brick ledge and as noted on drawings and details.
C. Corners: End Dam
D. Adhesive: Manufacturer’s standard for bonding material to itself.
E. Primer: Manufacturer’s standard spray primer

2.11 CONTROL JOINT FILL:
A. NS-closed cell neoprene sponge control joint filler strip

2.12 MORTAR TRAP-DRAINAGE SYSTEM:
A. High-density polyethylene strands woven into a 90% open mesh.
B. 10” high x 2” thick
C. Manufacturer: HB or equal

2.13 WEEP HOLES/VENTS:
A. Stamped aluminum louvered vents of size to fit head joints in brickwork or blockwork.
B. Manufacturer: HB or equal

PART 3 - EXECUTION

3.1 HORIZONTAL JOINT REINFORCING:
A. Place in bed joints at maximum 16 inches on center vertically or as noted on architectural and structural drawings (which ever is more restrictive).
B. Place in 1st and 2nd bed joints above lintels and below sills of openings; lap ends 6 inches.
C. Use prefabricated corner sections at corners; use tees at wall intersections.

3.2 CAVITY WALL TIES:

A. Tie wythes of masonry cavity wall together with cavity wall ties.
B. Provide not less than 1 1/2 inch air space between back of exterior wythe and sheathing.
C. Install X-Seal over top of X-Seal tape. X-Seal anchors legs shall penetrate through the rigid insulation and bear on the CMU.
D. Space maximum 16”x16” apart.

3.3 FLASHINGS AT MASONRY - GENERAL:
A. Provide concealed flashing at, or above, shelf angles, lintels, ledges, and other obstructions to flow of water in wall to divert such water to exterior.
B. Prepare masonry surfaces which are to receive flashings, smooth and free from projections which could puncture flashing.
C. Place flashing on sloping bed of mortar and cover with mortar.
D. Seal penetrations in flashing with mastic before covering with mortar.
E. Extend flashing full length of lintels and shelf angles and 12 inches into masonry each end; at heads and sills use one piece only (no splices).
F. Turn up ends of flashings minimum 6 inches and seal, forming pan; extend beyond brick 1/2”.

3.4 WEEPHOLES:
A. Provide full head joint weeps at maximum 30” centers.

3.5 STABILIZER BAR
A. Install Slip-Set stabilizer bars at all CMU expansion / control joints.
B. Field bend where required to tile horizontal and vertical surfaces together.
C. Locate every other course (16” on centers)

3.6 AIR, WATER AND VAPOR BARRIERS
A. Apply over CMU surface that is free from all foreign matter.
B. Brush, roll or spray 60 mils wet, 40 mils dry

3.7 CAVITIES AND CAVITY DRAINAGE SYSTEMS
A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
B. Install mortar netting material complying with manufacturer’s requirements and keeping clean.

3.8 FLASHING
A. Do not let this EPDM product come in contact with any asphalt products.
B. Install along brick ledges.
C. Dam ends to form seal
D. Extend up behind insulation and seal over damp-proofing behind insulation board with a termination strip.
E. Use Epra-Max Primer and Adhesive Tape to seal all joints and dams.

3.9 CONTROL JOINT FILLER STRIPS
A. Fill all control and expansion joints with closed cell filler strip to keep joints free and clear of mortar.
B. On CMU partitions, place joint filler strips between stabilizer bars (16” on centers)
C. Install backer rod and fill joint with sealant as per Section 07 92 00.

END OF SECTION

SECTION 04 20 00 – UNIT MASONRY

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, apply to this section.

1.2 SUMMARY

A. Section includes unit masonry assemblies consisting of the following:
   1. Face brick
   2. Concrete masonry units (CMU)
   3. Mortar and grout
   4. Reinforcing steel
   5. Masonry joint reinforcement
   6. Ties and anchors
   7. Miscellaneous masonry accessories.

B. It is the intent that Contractor performing Work of this Section shall be responsible for performing the work specified in Sections 04 05 13 “Masonry Mortaring and Grouting” Section 04 05 23” Masonry Accessories” Section 04 72 00 “Cast Stone Masonry” and Section 07 19 00 “Water Repellents”.

1.3 RELATED SECTIONS

A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforced steel in grouted cells.

1.5 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strength (f’m) at 28 days.
B. Determine net-area compressive strength (f’m) of masonry from average net-area compressive strengths of masonry units and mortar type (unit strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602
C. Determine net-area compressive strength (f’m) of masonry by testing masonry prisms according to ASTM C1314

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For the following:
   1. Masonry Units: Show size, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail

C. Samples for Initial Selection: For the following:
   1. Colored mortar
   2. Weep holes/vents

D. Samples for Verification: For each type and color of the following:
   1. Face brick, in the form of straps of 5 or more bricks.
   2. Pigmented mortar. Make samples using same sand and mortar ingredients to be used on Projects.

E. Qualification Data: For testing agency
F. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturer's product names, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.

G. Materials Certificates: Include statements of materials properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
   1. Masonry Units:
      (a) Include material test reports substantiating compliance with requirements. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

   2. Cementituous materials. Include brand, type, and name of manufacturer.
   3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Reinforcing bars
   6. Joint reinforcement.
   7. Anchors, ties, and metal accessories

H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specifications
   2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

I. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide a statement of net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602
J. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold weather requirements.

1.7 QUALITY ASSURANCE
A. This section outlines only <u>minimum</u> standards and requirements. Refer to the Drawings, and other sections of the specifications for additional requirements. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies and clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.
B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548
C. Source Limitations for Mortar Materials: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
D. Sample Brick Panels and Concrete Masonry Panels:
   1. Be prepared to lay a minimum of 3 sample panels of the face brick and each type of CMU for the approval of joint finishes, mortar color and other conditioning to guide the masonry work. Panels shall be approximately 4' x 6' in size but having no less than 100 units.

(a) Clean exposed faces of panels with masonry cleaner indicated.
(b) Protect approved sample panels form the elements with weather-resistant membrane
(c) Apply masonry water repellent to sample panel exterior exposed masonry
(d) Approval of sample panels is for color, texture, and blending masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetics qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
(1) Approval of sample is for color, texture, and blending of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and executions.
1. Build mockup of typical wall area as shown on Drawings.
(a) Include a sealant-filled joint at least 16” long in each exterior wall mockup
(b) Include a through-wall flashing installed for a 24” length in corner of exterior wall mockup approximately 16” down form top of mockup, with a 12” length of flashing left exposed to view. (Omit masonry above half of flashing)
(c) Include metal studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer mockup

2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
(a) Approval of mockups is also for the other material and construction qualities specifically approved by Architect in writing
(b) Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 “Project Management Coordination”.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
B. Store cementitious materials on elevated platforms, under cover, and in dry location. Do not use cementituous materials that have become damp
C. Store aggregates where grading and other required characteristics can be maintained, and contamination be avoided.
D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS
A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work. Cover partially completed masonry when construction is not in progress.
1. Extend a minimum of 24” down both sides and hold cover securely in place.
2. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24” down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated load for at least 3 days after building masonry walls for columns.
C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come into contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of windows and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain

D. Cold-Weather Requirements: Do no use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damage by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 ºF and above and will remain so until masonry has dried, but not less than 7 days after complete cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

PART II - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chip, crack, or other defects exceeding limits stated in standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS (CMU)

A. General:
   1. Provide thoroughly competent foreman. No substitution will be accepted.
   2. Provide the necessary scaffolding, adequate and safe in accordance with all local laws and ordinances. Maintain during construction and remove after completion.
   3. During erection, keep exposed walls dry by covering at the end of each day or shutdown period with canvas or waterproof paper and boards.
   4. All masonry units shall be stacked on raised pallets on platforms so that they will not be in contact with the ground. While stacked on the job, masonry units shall be covered and protected with a waterproofing cover.
   5. Do not lay masonry in temperatures below 36 ºF or when the temperature is predicted to go below 36 ºF within 24 hours.
   6. Final selection of all types of masonry units shall be made by the Architect and Owner.
   7. All exposed CMU exterior corners located inside the buildings shall be bullnosed.

B. Materials and Products
   1. Gray Smooth-face Concrete Masonry Units:
      (a) Non-load-bearing and load-bearing gray units. All exposed-to-view exterior surfaces to be sealed and painted as noted on the Drawings. Provide end and corner units, etc. as required, to complete walls as drawn.
      (b) ASTM C90, Grade N, Type 1
      (c) Nominal Face Dimensions: 8” x 16”

(d) Units shall be well graded, lightweight expanded clay or expanded shale aggregate and Portland cement.
(e) Only units of first quality appearance shall be used, with any damaged units culled.
(f) Units shall be 3-3/8", 5-5/8", 7-5/8", 9-5/8" or 11-5/8" thick – Refer to Drawings.
(g) Approved Manufacturer: Complying with all standards of this specification

2. Integral color – Smooth face Concrete Masonry Units:
   (a) Non-load-bearing and load-bearing units. All exposed-to-view exterior surfaces to be integral CMU color. Refer to Drawings for locations of all integral colored CMU and locations of different colors. Provide end and corner units, etc. as required, with exact color match, to complete walls as drawn.
   (b) ASTM C90, Grade N, Type 1
   (c) Comply with ASTM C129 for non-load-bearing concrete masonry units. Units shall be made of aggregate conforming to ASTM C33 or ASTM C331
   (d) Nominal Face Dimensions: 4" x 16", 8" x 16", 8" x 8"
   (e) Units shall be well graded, lightweight expanded clay or expanded shale aggregate and Portland cement.
   (f) Only units of first quality appearance shall be used, with any damaged units culled.
   (g) Units shall be 3-3/8", 5-5/8" or 7-5/8" thick – Refer to Drawings.
   (h) Refer to elevation drawings for locations of different CMU colors. **VERIFY ALL COLORS AND PATTERNS WITH THE ARCHITECT PRIOR TO ORDERING AND INSTALLATION.**
   (i) Approved Manufacturer: Featherlite Building Products or Architect approved equal.
   (j) CMU Color: As selected by Owner and Architect.

3. Integral Color Split-face Concrete Masonry Units:
   (a) Solid non-load-bearing and load-bearing rockface units. All exposed-to-view exterior surfaces to be integral CMU color. Refer to Drawings for locations of all integral colored CMU and locations of different colors. Provide end and corner units, etc. as required, with exact color match, to complete walls as drawn.
   (b) At areas where the interior (smooth) face of rockface non-load-bearing and load-bearing units are exposed, fill and paint as noted on the Drawings.
   (c) ASTM C90, Grade N, Type 1
   (d) Comply with ASTM C129 for non-load-bearing concrete masonry units. Units shall be made of aggregate conforming to ASTM C33 or ASTM C331
   (e) Nominal Face Dimensions: 4" x 16", 8" x 16", 8" x 8"
   (f) Units shall be well graded, lightweight expanded clay or expanded shale aggregate and Portland cement.
   (g) Only units of first quality appearance shall be used, with any damaged units culled.
   (h) Units shall be 3-3/8", 5-5/8" or 7-5/8" thick – Refer to Drawings.
   (i) Refer to elevation drawings for locations of different CMU colors. **VERIFY ALL COLORS AND PATTERNS WITH THE ARCHITECT PRIOR TO ORDERING AND INSTALLATION.**
   (j) Approved Manufacturer: Featherlite Building Products Corporation or Architect approved equal.
   (k) CMU Color: As selected by Owner and Architect.

4. Gray Smooth-face Concrete Masonry Units:
   (a) Non-load-bearing and load-bearing gray units. All exposed-to-view exterior surfaces to be sealed and painted as noted on the Drawings. Provide end and corner units, etc. as required, to complete walls as drawn.
   (b) ASTM C90, Grade N, Type 1

(c) Nominal Face Dimensions: 8” x 16”
(d) Units shall be well graded, lightweight expanded clay or expanded shale aggregate and Portland cement.
(e) Only units of first quality appearance shall be used, with any damaged units culled.
(f) Units shall be 3-3/8”, 5-5/8”, 7-5/8”, 9-5/8” or 11-5/8” thick – Refer to Drawings.
(g) Approved Manufacturer: Featherlite Building Products Corporation or Architect approved equal.

5. Integral Color Smooth-face Concrete Masonry Sill Blocks:
(a) All exposed-to-view exterior surfaces to be integral CMU color to match other CMU block in wall exactly. Verify colors with Architect.
(b) ASTM C90, Grade N, Type 1
(c) Nominal Face Dimensions: 4” x 8” or as specifically noted on the Drawings.
(d) Units shall be well graded, lightweight expanded clay or expanded shale aggregate and Portland cement.
(e) Only units of first quality appearance shall be used, with any damaged units culled.
(f) Approved Manufacturer: Featherlite Building Products Corporation or Architect approved equal.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer’s mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
(a) Approved Products: 1 of the following, or Architect approved equal:
(i) “Dry-Block Mortar Admixture”: W.R. Grace & Co.
(ii) “RainBloc for Mortar”: ACM Chemistries, Inc.
(iii) “Krete Gard Mortar Mix”; Krete Industries, Inc.
(iv) “Rheopel Plus Mortar Admixture”: BASF Master Builders.

2.3 BRICK

2.4 MORTAR AND GROUT MATERIALS
A. Refer to Section 04 05 13 “Masonry Mortaring and Grouting”

2.5 REINFORCEMENT, TIES AND ANCHORS
A. Refer to Section 04 05 23 “Masonry Accessories”

2.6 CAST STONE
A. Refer to Section 04 72 00 “Cast Stone Masonry”

2.7 MASONRY WATER REPELLENTS
A. Refer to Section 07 19 00 “Water Repellents”

2.8 ADDITIONAL STRUCTURAL REINFORCEMENT
A. Reference structural engineering drawings for additional structural reinforcing and requirements for masonry walls.

2.9 MISCELLANEOUS ANCHORS
A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dipped galvanized to comply with ASTM A153/A153M, Class C; of dimensions indicated.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Section 07 62 00 “Sheet Metal Flashing and Trim” and as follows:
   1. Stainless Steel: ASTM A240/A240M, Type 304, 0.016” thick.
   2. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3” into wall and out to exterior face of wall. At exterior face of wall, bend metal on itself for 3/4” down into joint 3/8” to form a stop for retaining sealant backer rod.

B. Concealed Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
   1. Provide Peel-N-Seal 40 mil with mechanical fastened termination bar, sealant bead, adhesives and accessories for base flashing and lintel flashing as manufactured by one of the following or as approved by architect by issued addendum:
      (a) Approved Products:
         (i) Tamko TW Flash-N-Wrap-40
         (ii) Grace Perm-A-Barrier
         (iii) Hohmann & Barnard, Sandell, Flex-Flashing
         (iv) Carlisle Flexphalt TWF
         (v) Polyguard
         (vi) W.R. Meadows Adhesive Back Air shield with top termination bar

C. Adhesives, Primers, and Seam Tapes for Flashing: Flashing manufacturer’s standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

D. Solder and Sealants for Sheet Metal Flashings:
   1. Solder on Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
   2. Elastomeric Sealant: ASTM C920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35%; of width and thickness indicated; formulated from neoprene

B. Pre-formed Control Joint Gasket: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, DesignationM2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt)

D. Continuous Mortar Net: Provide approved continuous mortar net where indicated on wall sections to prevent mortar from blocking drainage of weeps.

2.12 MORTAR AND GROUT MIXES

A. Refer to Section 04 05 13 “Masonry Mortaring and Grouting”

PART III – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work
   2. Verify that foundations are within tolerances specified.

3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping system to verify actual locations of piping connections
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, CMU

A. Lay all exterior and interior wythes of concrete masonry units in a running bond, or as specifically noted on the elevations and details. Lay the number of courses and vertical dimensions as detailed
B. Provide approximately 3/8" wide tooled hard joints
C. Provide full mortar bed smooth or slightly furrowed. Butter end of units with sufficient mortar to completely fill head joints
D. Lay no units when the temperature is below 36 ºF or when the temperature is predicted to go below 36 ºF within 24 hours.
E. All masonry work shall be laid true to dimension, plumb, squared and in bond, and properly anchored with vertical joints in line plumb and true.
F. No exposed broken, chipped, or cracked units will be allowed
G. Build in ground conduits, switch boxes, anchors and nailing blocks as required and where directed. Cut openings for electrical devices no larger than can be covered by a standard sized plate. Replace unit masonry in which larger than necessary openings are cut rather than patch openings with mortar or other materials.
H. Form chases, slots, etc. and patch masonry work as required for all trades.
I. Bond all intersection of walls and partitions.
J. Provide weep holes approximately 30" apart at the bottom of all walls and at all shelf plates and lintels.
K. Take care to wipe masonry work with rough cloth or brush as work progresses to prevent unsightly and unnecessary mortar stains. No mortar stains will be accepted on the final wall
L. Metal flashing will be furnished by the sheet metal section, unless otherwise noted, placed by this section where it is to be built into the masonry.
M. Provide solid masonry at door and window jambs and at the end of exterior masonry walls
N. In laying masonry, avoid over plumbing and pounding of corners and jambs to fit stretcher units after being set in position. Where an adjustment must be made after mortar has started to set, the mortar shall be removed and replaced with fresh mortar.
O. Do all type of cutting with a Carborundum type saw
P. Expansion joints shall be plumb and uniform and a maximum of 30' on center. See exterior elevation drawings for locations, or get final layout from Architect, caulk in accordance with Section 07 92 00 – Joint Sealants
Q. Ridges at horizontal and vertical intersections of joints will not be acceptable and must be smoothen out
R. Install control joint material at all control joints
S. Install all masonry reinforcing as shown on the Drawings and as specified elsewhere.
T. Final selection of all types and colors of masonry units shall be made by the Architect.

3.3 MORTAR BEDDING AND JOINTING

A. Refer to Section 04 05 13 "Masonry Mortaring and Grouting"

3.4 MASONRY JOINT REINFORCEMENT, TIES, AND ANCHORS

A. Refer to Section 04 05 23 "Masonry Accessories"

3.5 CAST STONE

A. Refer to Section 04 72 00 "Cast Stone Masonry"

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Refer to Section 04 05 13 “Masonry Mortaring and Grouting”
B. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
    1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
    2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

C. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
    1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
    2. Limit height of vertical grout pours to not more than 60”.

3.7 FIELD QUALITY CONTROL

A. Comply with Section 01 45 00 “Quality Control” for field inspecting and testing.
B. Testing Frequency:
    1. 1 set of prism tests for every 5,000 ft^2 of completed wall area.
    2. 1 set of mortar tests in accordance with ASTM C780 for aggregate ratio and water content, consistency, and compressive strength, for every 25 cu. yds. mortar
    3. 1 set of grout tests in accordance with ASTM C780 for compressive strength and slump, for every 25 cu. yds. grout.

3.8 CLEANING AND POINTING

A. At the completion of the work, all exposed masonry, both interior and exterior, shall be thoroughly cleaned of dirt, mortar, and stain by washing and brushing.
B. Do not use wire brushes, acid or other solutions which will cause discoloration. Thoroughly clean using stiff brushes and clear water.
C. Examine all joints carefully. Rake out all defective joints to a depth of at least 3/4” Remove all loose mortar and dust and fill solid dense surface same as the other finished joints. Wet the block before pointing. All excess mortar streaks, etc. shall be removed. If necessary, the block work shall again be cleaned down. After cleaning, rinse thoroughly with clean water.
D. At the completion of work, all holes in mortar joints of exposed masonry shall be pointed and all defective joints shall be cut out and re-pointed.
E. Exposed masonry shall be protected against staining from any other sources and excess mortar shall be wiped off the surface as the work progress.

3.9 MASONRY WATER REPELLENT

A. At new exterior masonry walls apply 2 coats applied in accordance with manufacturer’s specifications and recommendations, and as specified in Section 07 19 00 “Water Repellents”. Flood coat wall starting at top and working down to ground line.

END OF SECTION

SECTION 05 12 00 – STRUCTURAL STEEL FRAMING
(Reference Structural Documents)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General Supplementary Conditions, apply to this Section.

1.2 SUMMARY
A. Section includes labor, materials, services, equipment, and appliances required in connection with or incidental to furnishing, fabricating, delivering, and erecting structural steel complete, as described this Section, shown on Drawings, or reasonably implied therefrom, including, but not limited to:
1. Structural steel columns, girders, beams, and angles
2. Angle frames for openings in floors and roofs
3. Steel plates and miscellaneous deck support angles
4. Connections and component parts
5. Qualification of welders employed on the Project.
6. Galvanizing of items
7. Shop prime coat painting and field touch-up painting.
8. Grouting of base plates
9. Temporary bracing of construction
10. Fabrication/erection in inspection and testing

1.3 RELATED SECTIONS
A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 PERFORMANCE REQUIREMENTS
A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD loads as indicated in AISC Beam Allowable Uniform Loads Tables unless otherwise noted on the structural documents. See structural sheets.
1. Select and complete connections using details indicated and AISC's "Manual of Steel Construction, Load and Resistance Factor Design," Volume 2, Part 9.

1.5 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Show fabrication of structural-steel components.
C. Welding Certificates.
D. Mill Test Reports.
E. Source quality-control test reports.

1.6 QUALITY ASSURANCE
A. This Section outlines minimum standards and requirements. Refer to the Structural Drawings for additional requirements. Where in conflict, information on Structural Drawings shall take precedence. Bring all conflicts and discrepancies between documents to the attention of the Architect and Engineer and do not start work until such conflicts and discrepancies are clarified and corrected.
B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd. An otherwise qualified fabricator who is not a member of the AISC Certification Program will be accepted if satisfactory evidence of qualifications is submitted prior to award of Contract. For non-certified fabricators, Contractor shall submit a resume describing

plant size, equipment, quality control procedures, personnel, and experience on comparable sized projects within the last three (3) years.

C. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code-Steel.”
D. Comply with applicable provisions of AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.
E. Pre-installation Conference: Conduct conference at Project site in accordance with Section 01 31 00, “Project Management Coordination”.

PART 2 – PRODUCTS

2.1 STRUCTURAL-STEEL MATERAILS

A. W-Shapes: ASTM A 992/A 992M.
B. Channels, Angles: ASTM 36/A 36M.
C. Plate and Bar: ASTM A 36/A 36M.
D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, Structural Tubing
E. Steel Pipe: ASTM A 53/A 53M, Type E, or S, Grade B.
F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Non High-Strength Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
B. Unheaded Anchor Rods: ASTM F 1554, Grade 36,
    1. Configuration: Straight.
    2. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Headed Anchor Rods: ASTM F 1554, Grade 36, Straight.
    1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

D. Threaded Rods: ASTM A 36/A 36M.

2.3 PRIMER

A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.
B. Primer: Fabricator’s standard lead and chromate free, non-asphaltic, rust-inhibiting primer

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, non-metallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC’s “Code of Standard Practice for Steel Buildings and Bridges” and AISC’s “Load and Resistance Factor Design Specification for Structural Steel Buildings”.

2.6 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
    1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50mm).
    2. Surfaces to be field welded.
    3. Surfaces to receive sprayed fire-resistive materials.

4. Galvanized surfaces.
5. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits, Prepare surfaces according to the following specifications and standards:
6. SSPC-SP 2, “Hand Tool Cleaning”.
7. SSPC-SP 3, “Power Tool Cleaning”.
8. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at a rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods and inspections requirements that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of Part 3, Article “Field Quality Control”.
B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding.

PART 3 – EXECUTION

3.1 ERECTION

A. Examination: Verify elevations of concrete and masonry- bearing surfaces and locations of anchor rods, bearing plates, and other embedment, with steel erector present, for compliance with requirements.
   1. Proceed with installation only after satisfactory conditions have been corrected.

B. Set structural accuracy in locations and to elevations indicated and according to AISC’s “Code of Standard Practice for Steel Buildings and Bridges” and “Load and Resistance Factor Design Specifications for Structural Steel Buildings”.
C. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to sure. Comply with manufacturer’s written installation instructions for shrinkage-resistant grouts.

D. Maintain erection tolerances of structural steel within AISC’s “code of Standard Practice for Steel Building and Bridges”.

3.2 FIELD CONNECTIONS

A. Non-high strength Bolts, Nuts and Washers: Install ASTM A307, Grade A, carbon steel, hex-head bolts; carbon-steel nuts; unhardened steel washers.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and Load and Resistance Factor Design Specifications for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high strength bolted connections.
B. Welded Connections: Field welds will be visually inspected according to AWS D1.1
   1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's options:
      a. Liquid Penetrant Inspection: ASTM E 165
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General Supplementary Conditions, apply to this Section.
- B. Structural Drawing Notes and Details
- C. AISC, Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, including Commentary and Supplements.
- D. ASTM A 36, Structural Steel.
- E. AWS D1.1, Structural Welding Code.

1.2 SUMMARY
- A. Section includes:
  1. Steel Framing and supports for mechanical and electrical equipment and for applications where framing and supports are not specified in other Sections.
  2. Shelf angles.
  3. Loose Lintels.
  4. Loose bearing and leveling plates.
  5. Steel ladders, including cage ladders and those for access to roof hatch/es.
  6. Fabrication of bollards, anchors and railings
  7. Fabrication and installation of custom decorative steel fence and gate with logo emblem as indicated on drawings all fully hot-dip galvanized after fabrication and painted on-site. Provide slow spring loaded hinge for gentle controlled closing of gate to prevent injury and receiver on inside face of gate for owner furnished padlock.

1.3 RELATED SECTIONS
- A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.
- B. Submittal Procedures: Section 01 33 00
- C. Structural Steel: Section 05 12 00

1.4 SUBMITTALS
- A. Product Data: Manufacturer's descriptive technical literature for applicable manufactured items, including installation instructions and maintenance recommendations. Also for the following:
  1. Paint products

- B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, and details of metal fabrications and their connections, Show anchorage and accessory items.
  1. Provide templates for anchors and bolts specified for installation under other Sections.

- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, mane and addresses of architects and owners, and other information required.

1.5 PROJECT CONDITIONS
- A. Field Measurements:

1. Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
2. Establish Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Non Ferrous Metals:
   1. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6
   2. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6

C. Ferrous Metals:
   1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   2. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
   3. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
   4. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16 inch wide slotted holes in webs at 2 inches o.c.
      (a) Width of Channels: 1-5/8 inches
      (b) Depth of Channels: 1-5/8 inches, unless indicated otherwise.
      (c) Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating; 0.079 inch nominal thickness.
      (d) Finish: Rust-inhibitive, baked-on, acrylic enamel, unless indicated otherwise.
   5. Malleable-Iron Castings: ASTM A 47, Grade 32510.
   6. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
   7. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
   8. Stainless steel fabricated containment pans under all cabinet sinks to fit glide-out shelves and under plaster traps.
   9. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal allow welded.

2.2 PAINT

A. Universal Shop Primer: Fast-curing, Lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats;
   1. Tnemec 90E-92, or approved equal.

B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
C. Galvanizing Repair Paint: "Z.R.C. Cold Galvanizing Compound" by Z.R.C. Products Company, or approved equal.
D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 SHOP PAINTING
A. Thoroughly clean surfaces of rust, scales, grease and foreign matter prior to prime painting.
B. Apply by spraying primer to 1 mil minimum thickness; leave surface smooth, free of heavy deposits, runs, sags, “holidays” and embedded particles.

2.4 FASTENERS
A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
C. Anchor Bolts: ASTM F 1554, Grade 36.
1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

D. Eyebolts: ASTM A 489
E. Machine Screws: ASME B18.6.3
F. Lag Bolts: ASME B18.2.1
G. Wood Screws: Flat head, ASME B18.6.1.
H. Plain Washers: Round, ASME B18.22.1
I. Lock Washers: Helical, spring type, ASME B18.21.1
J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594

L. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT
A. Non Shrink, Non Metallic Grout: Factory-packages, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL
A. Concrete Materials and Properties: Comply with requirements in Division 03 Section “Cast-in-Place Concrete” for normal weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength 0f 3,000 psi, unless otherwise indicated

2.7 GALVANIZING

A. Galvanize steel members, fabrication and assemblies after fabrications by hot dip process in accordance to ASTM A 123
B. Galvanize bolts, nuts, washers, iron and steel hardware components in accordance with ASTM A 153
C. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
D. Coating Weight: Conform to paragraph 5.1 of ASTM A 123 or Table 1 of ASTM A 153 as appropriate.
E. Surface Finish: Continuous, adherent, smoothly and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.
F. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
G. Touch up welds and surface abrasions with galvanizing repair paint.

2.8 FABRICATION

A. General:
   1. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
   2. Shear and punch metals cleanly and accurately. Remove burrs.
   3. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
   4. Weld corners and seams continuously to comply with the following:
      (a) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      (b) Obtain fusion without undercut or overlap
      (c) Remove welding flux immediately
      (d) At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   6. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
   7. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
   8. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening-up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night time sky heat loss.

      (a) Temperature Change (Range): 120 deg F; 180 deg F, material surfaces.

   9. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
   10. Remove sharp or rough areas on exposed traffic surfaces.
   11. Form exposed connection with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Located joints where least conspicuous.

B. Loose Bearing And Leveling Plates:

1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill places to receive anchor bolts and for grouting.
2. Galvanize plates after fabrication.

C. Loose Steel Lintels:
1. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
2. Weld adjoining members together to form a single unit where indicated.
3. Unless lengths are indicated on Drawings or in schedules, size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.
4. Galvanize loose steel lintels located in exterior walls.

D. Shelf Angles:
1. Fabricate shelf angles from steel angles of sized indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive ¾-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
2. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
3. Galvanize shelf angles to be installed in exterior walls.
4. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in place concrete.

E. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as need to complete the Work.
1. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cur, drill, and tap units to receive hardware, hangers, and similar items.
   (a) Fabricate units from slotted channel framing where indicated.
   (b) Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by ¼ inch tick by 8 inches long at 24 inches o.c. unless otherwise indicated.
   (c) Furnish inserts if units must be installed after concrete is placed.

2. Galvanize miscellaneous framing and supports where indicated.

F. Miscellaneous Steel Trim: Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed filed splices where possible.
1. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches form corners, and 24 inches o.c. unless otherwise indicated.
2. Galvanize miscellaneous steel trim in the following locations:
   (a) Exterior
   (b) Interior, where indicated

G. Steel Ladders:
1. Fabricate ladders for the locations shown with dimensions, spacings, details, and anchorages as required.
2. Space siderails 16 inches apart, unless otherwise indicated.
3. Space siderails of elevator pit ladders 12 inches apart.
4. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
5. Rungs: ¾-inch-diameter steel bars.

6. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces
7. Provide non-slip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by coating with abrasive material metallically bonded to rung.

    (a) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but not limited to, the following:
        (i) IKG Industries, a division of Harsco Corporations; Mebac
        (ii) SlipNOT Metal Safety Flooring, a W.S. Molnar Company; SlipNOT

8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit opening in gratings to no more than ½ inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize exterior ladders, including brackets and fasteners.
11. Prime ladders, including brackets and fasteners, with primer specified in Division 09 Section “Painting”.

H. Ladder Safety Cages:
1. General:
    (a) Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
    (b) Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
    (c) Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise noted.

2. Steel Ladder Safety Cage Fabrication:
    (a) Primary Hoops: 1/4-by-4-inch flat bar hoops.
    (b) Secondary Intermediate Hoops:1/4-by2 inch flat bar hoops
    (c) Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
    (d) Galvanize ladder safety cages, including brackets and fasteners.
    (e) Prime ladder safety cages, including brackets and fasteners, with primer specified in Division 09 Section “Painting”.

2.9 FINISHES

A. General:
1. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.
2. Finish metal fabrications after assembly.

B. Steel and Iron Finishes:
1. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
    (a) ASTM A 123/A 123 M, for galvanizing steel and iron products.
    (b) ASTM A 153/A 153 M, for galvanizing steel and iron hardware.

2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
    (a) Exteriors (SSPC Zone 1B) SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning”.
    (b) Interiors (SSPC Zone 1A) SSPC-SP-3, “Power Tool Cleaning”

3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA-1, “Paint Applications Specification No.1 for shop painting.
   (a) Stripe paint corners, crevices, bolts, welds and sharp edges.

2.10 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated unspecified)
C. Class 1, Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish; non specular as fabricated; Chemical Finish: etched, medium matte; Anodic coating: Architectural Class 1, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggles bolts, through-bolts, lag bolts, wood screws, and other connectors.
   2. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
   3. Provide temporary bracing or anchor in formwork for items that are to be built into concrete, masonry, or similar construction.
   4. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
   5. Field Welding: Comply with the following requirements:
      a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      b. Obtain fusion without undercut or overlap.
      c. Remove welding flux immediately.
      d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

B. Setting Bearing and Leveling Plates:
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
   2. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
      a. Use non-shrink grout, either metallic or non-metallic, in concealed locations where not exposed to moisture; use non-shrink, non-metallic grout in exposed locations, unless otherwise indicated.
      b. Pack grout solidly between bearing surfaces and plates to ensure that no voids to remain.

C. Installing Miscellaneous Framing And Supports:
   1. General: Install framing and supports to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on Shop Drawings, if any.
   2. Anchor supports for operable partitions securely to and rigidly brace from building structure.
   3. Support steel girders on solid grouted masonry or concrete or steel pipe columns. Secure girders with anchor bolts embedded n grouted masonry or concrete or with bolts through top plates of pipe columns.
      a. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.
      b. Install columns on concrete footings with grouted base plates. Position and grout column base plates as specified above for setting and grouting bearing and leveling plates.
         (1) Do not grout base plates of columns supporting steel girders until girders are installed and leveled.

D. Installing Ladders:
   1. Support each ladder at top and bottom and at intermediate points spaced not more that 5 feet 0 inches o.c.
   2. Use welded or bolted brackets designed for adequate support and anchorage and to hold the ladder rungs 7 inches clear of the wall surface and other obstructing construction, sized to support design dead and live loads indicated.
   3. Size brackets to support design loads specified in ANSI A14.3.

3.2 ADJUSTING AND CLEANING

A. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1.for touching up shop-painted surfaces.
   1. Apply by brush of spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 07 21 00 – THERMAL INSULATION

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

1.2 REFERENCES

A. ASTM C236, Steady-State Thermal Performance of Building Assemblies.
B. ASTM C612, Glass Fiber Block and Board Thermal Insulation.
C. ASTM C665, Glass Fiber Blanket and Batt Insulation.
D. ASTM E84, Surface Burning Characteristics of Building Materials.
E. ASTM E136, Behavior of Materials in a Vertical Tube Furnace at 750°C.

1.3 SUBMITTALS

A. Product Data: Manufacturer's printed descriptive literature indicating compliance with requirements.
B. Samples Verification: Full-size units for each type of exposed insulation indicated.
C. Products Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
D. Research/Evaluation Reports: For plastic insulation.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.
B. Provide continuity of insulation at building insulation enclosure elements.
C. Fire-Test Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspection agency.

    1. Surface-Burning Characteristics: ASTM E84.
    2. Fire-Resistance Ratings: ASTM E119.
    3. Combustion Characteristics: ASTM E136.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

    1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
    2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site before installation time.
    3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 – PRODUCTS

2.1 VINYL FACED INSULATION
- A. Location:
  1. Draped application as indicated on drawings.
- B. Vinyl faced standard pre-engineered manufactured system.
- C. Non-flame spread classification.
- D. Use manufacturer supplied taping system.

PART 3 – EXECUTION

3.1 EXAMINATION
- A. Examine areas to receive insulation to insure work of preceding trades are completed.
- B. Check surfaces to receive insulation to assure they are in uniform plane and free of items detrimental to installation.

3.2 PREPARATION
- A. Clean substrates of substance harmful to insulation and vapor retarders, if any, including removing projections capable of interfering with insulation attachment.
- B. Proceed with application of insulation only if conditions are satisfactory.

3.3 INSTALLATION, GENERAL
- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement. Do not compress insulation.
- D. Water Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF BATT AND BLANKET INSULATION
- A. Install vinyl batt insulation (full ceiling purlin dimension) to all existing roofs.
- B. Install vinyl batt insulation (full wall purlin/girt dimension) to all exterior walls.

3.5 PROTECTION
- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other caused. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.6 CLEAN UP
- A. Check for any loose insulation installation and repair
- B. Dispose of all paper and insulation product waste, debris, dust and fiber.

END OF SECTION

SECTION 07 26 00 – VAPOR BARRIER

PART I – GENERAL

1.1 SUMMARY
- A. Products supplied under this section: Vapor barrier, seam tape, and mastic for installation under concrete slabs.

1.2 RELATED SECTIONS
- A. Section 03 30 00 – Cast-in-Place Concrete
- B. Section 06 10 00 – Rough Carpentry

1.3 REFERENCES
- A. American Society for Testing Materials (ASTM):
  1. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
  2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.
  3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
  4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
  5. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

- B. American Concrete Institute (ACI):
  1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.4 SUBMITTALS
- A. Quality control/assurance
  1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
  2. Manufacturer's samples, literature.
  3. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.

PART II - PRODUCTS

2.1 MATERIALS
- A. Vapor Barrier Below Slab and Grade Beams
  1. Permeance of less than 0.01 Perms [grains/($ft^2 \cdot hr \cdot inHg$)] as tested in accordance with ASTM E 1745 Section 7
  2. WVTR as tested by ASTM E96 of 0.008
  3. Strength: ASTM E 1745 Class A
  4. Thickness: 15 mils minimum
  5. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
     (a) Stego Industries: Stego Wrap 15 mil Vapor Barrier
     (b) W.R. Meadows: Perminator 15 mil
     (c) Reef Industries, Inc.: Griffolyn 15 mil Green Vapor Barrier

- B. Accessories
  1. Seam Tape: High density polyethylene tape with pressure sensitive adhesive. Minimum width of 4"

2. Vapor-Proofing Mastic: manufacturer recommended liquid applied vapor retardant mastic that seals manufacturer's multiple vapor barrier into a single monolithic layer.
3. Pipe Boot: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

C. Vapor Barrier at Exterior Stud Walls
1. DuPont Tyvek CommercialWrap

PART III – EXECUTION

3.1 PREPARATION
A. Ensure that base material is approved by Architect or Geotechnical Engineer
1. Level and compact base material.

3.2 INSTALLATION
A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643, except where more stringent requirements are shown or specified.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement. Use the largest practicable roll widths to minimize joints.
2. Lap vapor barrier over outside perimeter grade beams and interior grade beams, slice material to go around vertical reinforcing from the grade beam, tape seal spliced joint around penetration and apply continuous bed of mastic to bond barrier to top of perimeter grade beams. Mastic bond is not required where lapping over the top of interior grade beams.
3. Lap vapor barrier under smaller slab beams.
4. Overlap joints 6" and seal with manufacturer's tape. Do not proceed with any additional work if tape material does not properly adhere to barrier for a tight finish and attachment.
5. Seal all penetrations (including pipes) joints and laps per manufacturer's instructions.
6. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
7. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6" and taping all sides with tape.

END OF SECTION

SECTION 07 92 00 – JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General Supplementary Conditions, apply to this Section.
- B. Section 01 33 00 – Submittal Procedures
- C. Section 03 30 00 – Cast-in-Place Concrete
- D. Section 04 05 13 – Masonry Mortaring and Grouting
- E. Section 04 20 00 – Unit Masonry

1.2 REFERENCES
- A. ASTM C920, Elastomeric Joint Sealants.
- B. ASTM C919-12, Standard Application for Use of Sealants in Acoustical Applications.
- C. ASTM C1193-13, Standard Guide for Use of Joint Sealants
- D. Federal Specification TT-S 00227E, Sealant Compound, Elastomeric Type, Multi-component.

1.3 SUMMARY
- A. Section includes:
  1. Exterior sealants and sealants for moving joints, except for joints in those systems specified in other sections.
  2. Interior sealants and caulking.
  3. Joint Sealing is indicated as SEALANT, SEALANT AND BACKER ROD, SEALANT and BACKUP

1.4 SYSTEM PERFORMANCES
- A. Provide joint sealants that have been produces and installed to establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrate.

1.5 SUBMITTALS
- A. Product Data: Manufacturer's technical data for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Test Reports: Joint sealant-substrate laboratory test results including recommendations of joint sealer manufacturer for joint preparation and application of joint sealers applicable to project conditions. Test results of joint sealants for aged performances including hardness, stain resistance, adhesion and cohesions under cyclic movement, low-temperature flexibility, modules of elasticity at 100% strain, effects of heat aging, and effects of accelerated weathering.
- C. Field test results indicating which products and joint preparation methods demonstrated acceptable adhesion to joint substrates.
- D. Certificates: Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

  1. All interior and exterior exposed-to-view sealants even through specified in other Sections shall be the work of this Section.

B. Source Limitations: Obtain each type of sealant through one source from a single manufacturer.
C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates under environmental condition that will exist during actual installation.
2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E548 (withdrawn).
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:

1. Locate test joints where indicated or, if not indicates, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.

3. Notify Architect 7 days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
5. Test Method: Test joint sealants by hand-pull method described below:

    a. Install joint sealants in 5'-0" long joints using same materials and methods for joint preparation and joint sealant installation required for the completed Work. Allow sealants to cure in accordance with manufacturer's recommendation before testing.
    b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2" long at sides of joint and meeting crosscut at one end. Place a mark 1" from cross-cut end of 2" piece.

c. Use fingers to grasp 2” piece of sealant between cross-cut end and 1” mark; pull firmly at a 90° angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

6. Report whether sealant in joint connected to pulled-put portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
7. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrate during testing.

F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 01 33 00 – Project Management and Coordination.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
B. Store and handle materials in compliance with manufacturer’s written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40°F.
3. When joint substrate are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealant where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.9 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from the date of Substantial Completion.

C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

D. Special warranties specified in this Article exclude deterioration of failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Exterior Vertical Plane Joint Sealant
1. Type: polyurethane-based sealant, complying with ASTM C920, Type M, Grade NS, Class 25
2. Joint Primer: By same sealant compound manufacturer
3. Color: To match adjacent surfaces with custom color mix.
4. Location: Exterior and interior joints in concrete and masonry; between masonry and concrete; between steel and masonry; perimeters of steel frames in exterior walls; and in ceiling joints.
5. Approved Manufacturers:
   (a) BASF
   (b) Sika
   (c) Pecora

B. Interior Vertical Plane Joint Sealant
1. Type: Acrylic emulsion-based sealant, complying with ASTM C920, Type S, Grade NS, Class 25.
2. Color: Submit for Architect's approval
3. Location: Interior joint in field-painted, vertical and overhead surfaces, at steel door frames, at gypsum drywall, concrete, and at concrete unit masonry; and all other interior locations not indicated otherwise.
4. Approved Manufacturers:
   (a) BASF
   (b) Sika
   (c) Pecora

C. Horizontal Plane Joint Sealant

1. Type: THC-900 high performance multi-component, self-leveling polyurethane joint sealant, complying with ASTM C920, Type M, Grade P, Class 25; and with FS TT-S-0027EE, Type 1, Class A
2. Joint Primer: By same sealant compound manufacturer.
3. Location: Exterior and interior joints in horizontal surfaces between metal and concrete, mortar and masonry.
4. Approved Manufacturers:
   (a) Tremco
   (b) Pecora

D. Expansion Joint Filler
1. Type: Sonoflex F, polyethylene closed-cell expansion joint filler. No less than 10 psi compression deflection (25%); surface water absorption of no more than 0.1 pounds per square foot, 3/8 inch nominal thickness x depth of surfacing.

E. Treated Pine Joint Filler
1. Type: Treated southern yellow pine species joint filler with removable wood stop for filling of joint sealant.

F. Acoustical Sealant: As specified in Section 09 21 16 – Gypsum Board Assemblies.

G. Mildew-Resistant Silicone Rubber Sealant:
1. Type: Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT. Provide type recommended by manufacturer for porosity of joint surfaces.
2. Locations: Seal at plumbing fixtures and countertops, tile, sinks, and lavatories
3. Approved Manufacturers:
   (a) BASF Building Systems; Omniplus,
   (b) Dow Corning Corporation; 786 Mildew Resistant
   (c) GE Advanced Materials-Silicones; Sanitary SCS1700.
   (d) Tremco Incorporated; Tremsil 200 Sanitary

H. Primers, Cleaners, Top Coats:
1. Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.

I. Sealant Backer Rod:
1. Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.re

J. Bond Breaker Tape:
1. Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

2.2 JOINT SEALANT BACKING
A. Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are accepted for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Provide preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance, complying with ASTM C1330.

1. Either flexible, open cell polyurethane foam or non-gassing, closed-cell poly-ethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.

C. Provide polyethylene bond-breaker tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.3 MISCELLANEOUS MATERIALS

A. Provide primer type recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate and field tests.
B. Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrate and adjacent non-porous materials.
C. Provide non-staining, non-absorbent type masking tape compatible with joint sealants and materials.

PART 3 – EXECUTION

3.1 INSPECTION

A. Require installer to inspect joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerance and other conditions affecting joint sealant performance. Obtain installer's written report listing any conditions detrimental to performance of joint sealant work. Do not allow joint sealant work to proceed until satisfactory conditions have been corrected.

3.2 PREPARATION

A. At contractor's direction, installer, joint sealant manufacturer's representatives, and other trades whose work affects installation of joint sealants shall meet at Project site to review procedures and time schedule proposed for installation of joint sealants which is coordinated with other related work.
B. Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealant, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bong with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.

C. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond, do not allow spillage or migration onto adjoining surfaces.
D. Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
B. Comply with recommendations of ASTM C1193-13 for use of joint sealants as applicable to materials, applications, and conditions indicated.
C. Comply with the recommendations of ASTM C919-12 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.
D. Install sealant backing to comply with the following requirements:

    1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
        a. Do not leave gaps between ends of joint fillers.
        b. Do not stretch, twist, puncture or tear joint fillers.
        c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

    2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

E. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and provide uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
F. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform configuration indicated, to eliminate air pockets and to endure contact and adhesion of sealant with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

    1. Flush joint configuration per Figure 6B in ASTM C1193-13, where indicated.

        a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CORRECTION, PROTECTION AND CLEANING

A. Remove and replace improperly placed defective sealants. Defective works include: leakage, hardening, cracking, crumbling, running, staining of adjacent work, and loss of adhesion to joint substrate.
B. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damages or deteriorated joint sealants immediately and reseal joints with new materials to

produce joint sealant installations with repaired areas indistinguishable from original work.

C. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joint occur.

END OF SECTION

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Steel doors, steel door frames, and steel frame components such as sidelites, borrowed lites, transom frames, and architectural stick systems as indicated on Drawings and Schedules as manufactured by manufacturers specified in Part 2. No substitutions will be accepted.

B. All steel doors and frames shall use Steelcraft hinge locations.

1.3 RELATED SECTIONS

A. Section 08 71 00 – Door Hardware.

1.4 QUALITY ASSURANCE

A. Conform to requirements of ANSI 250.8 (SDI-100), ANSI A151.1, and other specifications herein named. Submit test reports upon request by the Owner or Architect.

B. Acoustical qualities: Doors shall have a minimum sound transmission classification of 28 as tested under ASTM E90 and ASTM E413.

C. Insulation properties: Doors shall have a U factor 0.363 (R factor of 2.85) for honeycomb core, U factor for polystyrene core of 0.263 (R factor 3.8), U factor for polyurethane core of 0.09 (R factor 11.1)

D. Underwriters' Laboratories (UL) and Warnock Hersey (WH), labeled fire doors and frames:

1. All labeled fire doors and frames shall be of the type which has been investigated and tested in accordance with UL 10B, ASTM E152-81AE02, NFPA 252, ANSI A2.2, or UL 10C.
2. Construct and install doors and frames to comply with applicable issue of ANSI/NFPA 80 "Standard for Fire Doors and Windows".
3. Warnock Hersey labeled doors and frames shall be manufactured to meet specific requirements of that labeling agency's current procedure for the tested hourly rating designated and shall be subject to inspection by representatives of the labeling agency.
4. A physical label or approved marking shall be affixed to the fire door or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency. Labels to be metal, paper or plastic. Stamped or die cast labels are not permitted. Labels are not to be removed, defaced or made illegible while the door is in service as covered in NFPA 80.
5. Conform to applicable codes for fire ratings. It is the intent of this specification that hardware and its application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.

E. Installer: Minimum 5 years documented experience installing products specified in this Section.

1.5 REGULATORY REQUIREMENTS

A. Doors and frames shall conform to applicable codes for fire ratings. All interior vertical stairwell doors shall carry a minimum 250°F temperature rise rating in addition to the required fire rating.

1.6 SUBMITTALS

A. Shop Drawings: Submit in accordance with provisions of Section 01 33 00 – Submittal Procedures.
B. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, and finish.
C. Indicate door elevations, internal reinforcement, closure method, and cutouts for glazing and louvers, as applicable.
D. Submit manufacturer's installation instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Doors and Frames
   1. Deliver hollow metal work cartooned or crated to provide protection during transit and job storage noting door number/marking on outside of carton.

B. Storage of Doors:
   1. Store doors vertically in a dry area, under proper cover. Place the units on at least 4 inch high wood sills on floors in a manner that will prevent rust and damage. Avoid storage in non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting. If the door becomes wet, or moisture appears, remove protective wrapping immediately. Provide a 4" space between the doors to permit air circulation.

C. Storage of Frames:
   1. Store frames in an upright position with heads uppermost under cover on 4" wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting. Store assembled frames in a vertical position, five units maximum in a stack. Provide a 2" space between frames to permit air circulation.

1.8 COORDINATION

A. Coordinate work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
B. Coordinate work with frame opening construction, door and hardware installation.
C. Sequence installation to accommodate required door hardware.
D. Verify field dimensions for factory assembled frames prior to fabrication.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers for doors and frames specified are listed below. Only the products of the listed manufacturers will be accepted. No substitutions will be accepted.

   1. Allegion, Steelcraft
   2. Assa Abloy, Ceco Doors
   3. Assa Abloy, Curries
   4. Black Mountain Door, Amweld
   5. Republic Doors and Frames
   6. Tex-Steel Corporation

B. Provide steel doors and frames from a single manufacturer.

2.2 MATERIALS

A. Hot-rolled Steel Sheets and Strips
   1. Commercial quality carbon steel, pickled and oiled, to comply with ASTM A1011 and ASTM A568
B. Cold-rolled Steel Sheets
   1. Commercial quality carbon steel, to comply with ASTM A1008 and ASTM A568
C. Galvanized Steel Sheets
   1. Zinc-coated carbon steel sheets of commercial quality, hot dipped galvanized according to ASTM A653, with A60 or G60 coating designation, mill phosphatized. Galvannealed steel shall be treated to ensure proper paint adhesion. All steel components used in galvannealed doors and/or frames shall meet the galvanized specification.
D. Support and Anchors
   1. Fabricate with no less than 18 gauge sheet steel, galvanized where used with galvanized frames
E. Shop applied primer
   1. Rust-inhibitive enamel or paint, air-dried or baked, suitable as a base for specified finish paints to comply with ANSI A224.1.
F. Fire-Assemblies
   1. Provide units that display appropriate UL or FM labels for fire rating indicated.

2.3 FABRICATION

A. Fabricate units to be rigid, neat in appearance, and free from defects, warps and buckles. Weld exposed joints continuously, grind, and dress to make smooth, flush and invisible.

   1. Prepare steel doors and frames to receive mortised and concealed finish hardware, including cutouts reinforcing, drilling and tapping, complying with ANSI A115 “Specifications for Door and Frame Preparation for Hardware”.
   2. Reinforce units to receive surface-applied finish hardware to be field applied.
   3. Locate finish hardware as indicated, if not indicated elsewhere, per DHI “Recommended Locations for Builder’s Hardware”.

2.4 DOORS

A. General
   1. SDI grades and models specified below or as indicated on drawings or schedules.

B. Exterior Doors
   1. Exterior, food service, laundry, janitorial, mechanical, and other doors exposed to abuse and moisture shall be minimum 16 gauge hot-dipped galvannealed steel to comply with SDI-112. ANSI/SDI-100, Grade III, extra Heavy-Duty, Model 4.
      (a) All doors seamless hollow metal construction with tops sealed or capped for all exterior doors.
      (b) All exterior doors to be stiffened with continuous formed steel sections and insulated with foam fill.
      (c) Provide hardware reinforcement with offset so that faces of mortised hardware items are flush with door surface as follows:
         (i) Lock Front, Strike, Flush Bolt Reinforcements: 12 gauge
         (ii) Lock Reinforcement Units: 14 gauge
         (iii) Closer Reinforcements: 12 gauge
         (iv) Exit Device Reinforcements: As required for specific unit.
         (v) Other Hardware Reinforcements: As required for adequate strength and anchorage.

C. Interior doors

1. Shall be 18 gauge, cold rolled stretcher-leveled steel sheets and other metal components from hot or cold-rolled steel sheets. Hot-dipped galvannealed steel.

D. Construction of Doors:
   1. Flush Doors:
      (a) Laminated core doors:
         (i) L-Series Doors shall be full-flush fabricated from hot-dipped galvannealed steel, 16 gauge for exterior doors and 18 gauge for interior doors.
         (ii) Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.
      (b) Door shall have continuous vertical mechanical interlocking joints at lock and hinge edges with visible edge seams or with edge seams filled and ground smooth. The internal portion of the seam shall be sealed with epoxy. An intermittent fastening along the seam is not permitted. Doors shall have beveled 1/8” in 2” hinge and lock edges. Top and bottom steel reinforcement channels shall be galvannealed 14 gauge and projection welded to both panels.
      (c) All doors shall have Steelcraft standard hinge locations. Hinge reinforcements shall be 7 gauge for 1-3/4” doors. Lock reinforcements shall be 16 gauge and closer reinforcements 14 gauge – box minimum 6” high and 20” long. Hinge and lock reinforcements shall be projection welded to the edge of the door. Galvannealed doors shall have galvannealed hardware reinforcements. Adequate reinforcements shall be provided for other hardware as required.
      (d) Glass trim for doors with cutouts shall be 24 gauge steel conforming to ASTM A1008 cold rolled steel for interior openings and ASTM A924 for hot dipped galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60) for exterior openings. The trim shall be installed into the door as a four sided welded assembly. The trim shall fit into a formed area of the door face, shall not extend beyond the door face and shall interlock into the recessed area, or shall cap the cutout, but not extend more than 1/16” from the door face. The corners of the assembly shall be mitered, reinforced and welded. The trim shall be the same on both sides of the door. Exposed fasteners are not permitted. Labeled and non-labeled doors shall use the same trim.
      (e) Doors indicating divided glass lites shall be made using a door with a cutout and trim for one piece of glass. The small lites shall be created by an extruded aluminum grille work mechanically fastened to the glass lite trim on both sides of the door. The grille work sections shall be beveled on the exposed side and shall have a flange on the unexposed side to which glazing tape can be applied. The grille work shall be installed into both sets of glass trim prior to installing the door. One glass trim and muntin assembly shall be installed into the door. After glazing the other glass trim and muntin assembly shall be installed into the door.
      (f) All exterior out swing doors shall have the tops closed to eliminate moisture penetration. Door tops shall have no holes or openings. Top caps are permitted.
      (g) All exterior doors shall include a self-adjusting, concealed door sweep installed in the bottom channel. The bottom seal shall not include springs.

   2. Steel Stiffened Doors:
      (a) The door shall be vertically stiffened with steel stiffeners and sound deadened with fiberglass batt insulation. The stiffeners shall be hat shaped sections fabricated from 20 gauge steel located 6” on center and shall be welded to the inside of the face sheets 5” on center. The hat shape stiffeners shall be welded together at the top and bottom of the door. The areas between stiffeners shall be filled with fiberglass.

(b) Door shall have continuous vertical mechanical inter-locking joints at lock and hinge edges with visible edge seams, or with an edge seam filled and ground smooth. The internal portion of the seam shall be sealed with epoxy. One piece full height 14 gauge channel. Apply a continuous bead of structural epoxy in the internal vertical connection. An intermittent fastening along the seam is not permitted. Doors shall have beveled 1/8" in 2" hinge and lock edges. Top and bottom steel reinforcement channels shall be galvannealed 14 gauge and projection welded to both panels.
(c) All doors shall have Steelcraft standard hinge locations. Hinge reinforcements shall be 7 gauge for 1¾" doors. Lock reinforcements shall be 16 gauge and closer reinforcements 14 gauge – box minimum 6" high and 20" long. Hinge and lock reinforcements shall be projection welded to the edge of the door. Galvannealed doors shall have galvannealed hardware reinforcements. Adequate reinforcements shall be provided for other hardware as required.
(d) Glass trim for doors with cutouts shall be 24 gauge steel conforming to ASTM A924 hot-dipped galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60) for exterior openings. The trim shall be installed into the door as a four sided welded assembly. The trim shall fit into a formed area of the door face, shall not extend beyond the door face and shall interlock into the recessed area. The corners of the assembly shall be mitered, reinforced and welded. The trim shall be the same on both sides of the door. Exposed fasteners are not permitted. Labeled and non-labeled doors shall use the same trim.
(e) Doors indicating divided glass lites shall be made using a door with a cutout and trim for one piece of glass. The small lites shall be created by an extruded aluminum grille work mechanically fastened to the glass lite trim on both sides of the door. The grille work sections shall be beveled on the exposed side and shall have a flange on the unexposed side to which glazing tape can be applied. The grille work shall be installed into both sets of glass trim prior to installing the door. One glass trim and muntin assembly shall be installed into the door prior to glazing. After glazing the other glass trim and muntin assembly shall be installed into the door.
(f) All exterior out swing doors shall have the tops closed to eliminate moisture penetration. Door tops shall have no holes or openings. Top caps are permitted.
(g) All exterior doors shall include a self-adjusting, concealed door sweep installed in the bottom channel. The bottom seal shall not include springs.

3. Temperature Rise Doors:
   (a) Allegion Steelcarft T-Series doors shall be the same as 1¾" L doors except for the core. Doors shall be full-flush or full-flush seamless construction, fabricated from cold-rolled steel or hot-dipped galvannealed steel 20, 18, 16 or 14 gauge. Mineral board core material shall be designed to comply with the 250°F maximum temperature rise rating.

4. Stile and Rail Doors:
   (a) Stile and rail doors shall be tubular stile and rail construction, 1 ¾" thick and fabricated from 16 gauge from commercial quality carbon steel or galvannealed steel. Hinge reinforcements shall be 7 gauge, lock reinforcements 16 gauge, and closer reinforcements 14 gauge. Galvannealed doors shall have galvannealed hardware reinforcements. Adequate reinforcements shall be provided for other hardware as required.
      (a) A and AN-Series Doors:
         (i) A and AN-Series doors shall have stiles that extend the full height of the door. Rails shall be internally welded or permanently mechanically joined to the stiles forming a neat seam on the face.

2.5 FRAMES

A. Exterior, food service, laundry, janitorial, mechanical, and other door frames exposed to abuse and moisture shall be 14 gauge hot-dipped galvannealed steel.
B. Interior frames shall be 16 gauge hot-dipped galvannealed steel.
C. Construction of Frames:
    1. Flush Frames:
        (a) F-Series flush frames shall be formed of 16 gauge (1.3mm) for interior installations and 14 gauge (1.7mm) for exterior installations.
        (b) F-Series frames shall have 2 inch (51mm) faces. F and FN 18 (1mm), 16 (1.3mm), 14 (1.7mm) gauge frames shall be knocked down or set-up and welded. Miter corner shall have reinforcements with four concealed integral for secure and easy interlocking of jambs to head.
        (c) 16 gauge (1.3mm) and 14 gauge (1.7mm) frames shall be supplied with three (3) factory installed runner silencers per jamb and two (2) per head for pairs of doors. Stick on silencers will not be permitted. All 12 gauge (2.6mm) frames shall be supplied with loose pressure sensitive silencers for field application.
        (d) All frames shall use Steelcraft hinge locations. Frames for 1-3/4 inch (45mm) doors shall have 7 gauge (4.7mm) universal steel hinge reinforcements prepared for 4-1/2 inch (114mm) x 4-1/2 inch (114 mm) standard or heavy weight template hinges. Strike reinforcements shall be 16 gauge (1.3mm) and prepared for an ANSI A115.1 and ANSI A115.2 strike.
        (e) Frames for 1-3/8 inch (35mm) doors shall have 10 gauge (3.3mm) steel hinge reinforcements and preparations for 3-1/2 inch (89mm) x 3-1/2 inch (89mm) standard weight hinges. Strike jambs shall have a 14 gauge (1.7mm) reinforcement and preparation for cylindrical ANSI A115.3 strikes.
        (f) Steel plaster guards shall be provided at all mortised cutouts. All strike and hinge reinforcements shall be projection welded to the door frame. Reinforcements for surface applied door closers shall be 14 gauge (1.7mm) steel.
        (g) Galvannealed frames shall have galvannealed hardware reinforcements. Adequate reinforcements shall be provided for other hardware as required. F-Series frames shall be furnished with a minimum of six (6) wall anchors and two (2) adjustable base anchors of manufacturer's standard design. FN-Series frames shall be furnished with a minimum of six (6) wall anchors and two (2) fixed base anchors.
        (h) All exterior frames shall include a synthetic rubber pressure sensitive weather-stripping. Weather-stripping shall be mounted to the stop of the frame. Door and frame assembly shall have an air infiltration rate of 0.074 cfm/lineal foot of crack when tested in accordance with ASTM E283 and UL 1784.
            (i) Steel Plaster guards shall be provided at all mortised cutouts.
            (ii) All hinge and strike reinforcements shall be projection welded to the door frame.
            (iii) Reinforcements for surface closer shall be 14 gauge (1.7mm) steel. Adequate reinforcements shall be provided for other hardware when specified.
            (iv) Galvannealed frames shall have galvannealed hardware reinforcements.

    2. Construction of Architectural Stick Components:
        (a) Architectural stick frame assemblies shall be made of standard frame components, manufactured from 16 gauge (1.3mm) or 14 gauge (1.7mm) galvannealed steel. Where sticks are used at door openings and frame assemblies, they shall be prepared for hardware specified. Frame assemblies shall be fabricated from three (3) basic components:
            (i) Open sections (perimeter members), closed sections (intermediate members), and sill sections.
            (ii) Open sections shall be identical in configuration to Steelcraft standard frames.

(iii) Closed sections shall have identical jamb depths, face dimensions, and shall have full length internal reinforcement of 16 gauge (1.3mm) steel, factory spot-welded to both soffits at 8 inches (203mm) on center.
(iv) Sill sections shall be fabricated from galvannealed steel and shall be either flush with both faces of adjacent vertical members or recessed from one face of adjacent vertical members.

(b) Individual components shall be cut to length and notched to assure square joints and corners. All joints and corners of joint assembly shall be welded and ground smooth at the face of the sections. Frame assemblies shall be shipped to the jobsite completely welded. Field joints shall be permitted only when the size of the total assembly exceeds shipping limitations. When frame assemblies are subjected to windloads, vertical members shall be free of field splices.

(c) When specified, steel panels shall be furnished 3.8 inch (9.5mm) or 1-3/4 inch (45mm) thick as required. 3/8 inch (9.5mm) panels shall be made of 18 (1mm) cold-rolled steel faces with a corrugated fiberboard filler. 1-3/4 inch (45mm) panels shall be made of 20 gauge (0.8mm) cold-rolled steel faces with a honeycomb core. Cores shall be laminated to inside faces of both panels. Stick components and panels shall be furnished as specified in Paragraph 2.2. Steel channel glazing beads shall be provided with assemblies for all areas in which glass or panels are to be installed and shall be pierced and dimpled for oval head sheet metal screws.

(d) All necessary anchors for jambs, heads and sills of assemblies shall be provided. When verification of field dimensions are necessary, they shall be made by the contractor. Frame fabrication shall not begin until these dimensions have been submitted.

2.6 ACCESSORIES

A. Vision lites shall be as indicated on the Drawings; moldings shall be manufacturer's standard.

B. Louvers shall be as indicated on the Drawings; blade and frame configuration shall be manufacturer's standard or as specified elsewhere.

2.7 PROTECTIVE COATINGS

A. The inside of all frames shall be fully grouted, or when an anti-freeze agent is used, shall be coated with a fibered asphalt coating prior to grouting. Coating shall be applied by the contractor to a minimum 1/16 inch (1.6mm) thickness.

2.8 FABRICATION

A. Frames shall be supplied:
1. Set up and welded with faces welded and ground smooth. Miters of frames shall be back welded. Weld shall penetrate the outside face. Faces shall be dressed smooth and prime painted. Filler materials are not permitted.

B. Where indicated on Drawings, frames shall be supplied with hospital type stops terminating 4 inches (101.6mm) from the bottom of jambs on a 45 degree angle.

2.9 FINISH

A. All doors, frames and frame components shall be cleaned, phosphatized, and finished as standard with one coat of rust inhibiting prime paint in accordance with the ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames".

B. Factory finish painted doors and frames shall be cleaned, phosphatized, and finished with rust inhibiting prime paint capable of passing a 200-hour salt spray and 480-hour humidity test in accordance with ASTM B117 and ASTM D1735. Finish paint shall be in accordance with ANSI/SDI A250.3, "Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames".

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting framing for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION

A. Doors and frames shall be installed in accordance with ANSI/DHI A 115.1G, “Installation Guide for Doors and Frames” and/or manufacturer’s installation instructions and approved shop drawings. Fit doors accurately to frames and floors according to ANSI/SDI-100.
B. Except for frames located at cast-in-place concrete or masonry walls and at drywall, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors set. Remove temporary braces and spreaders after wall construction is completed. Ensure surfaces are smooth and undamaged.
C. In masonry construction, locate 3 wall anchors (minimum) per jamb at hinge and strike level.
D. Fire-rated Doors to comply with NFPA 80. Label doors and frames. Fit doors accurately to frames.
E. Smoke Control Doors to comply with NFPA 105. Fit doors accurately to frames.
F. Install door hardware in accordance with hardware manufacturer’s instructions and Section 08 71 00 – Door Hardware. Install hardware with only factory-provided fasteners. Adjust door installation to provide uniform clearance at head and jambs, to achieve maximum operational effectiveness and appearance.

3.3 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.
B. Final Adjustments: Adjust operating doors and hardware items just prior to final inspection and acceptance by the Owner and Architect. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are damaged, bowed or otherwise unacceptable.

3.4 PROTECTION

A. Provide protective measures required throughout the construction period to ensure that door and frame units will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08 33 00 – COILING DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Supplementary Conditions, apply to this Section
B. Division 1 for Administrative, Procedural and Temporary work requirements.
C. Reference Electrical Drawings and Specifications.
D. Section 01 31 00 – Project Management and Coordination
E. New Coiling doors to be engineered and designed for applicable IBC and Texas Windstorm requirements.

1.2 SUMMARY

A. Section includes electric-motor-operated overhead coiling security grilles where indicated on Drawings.
B. Steel and aluminum coiling overhead doors and security grilles.
C. Operating hardware, controls and supports.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each type of security grille. Include both published data and any specific data prepared for this Project.
B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations and details of framing members, opening dimensions, connection details, required clearances, anchorage spacing, installation details and accessories. Include relationship with adjacent materials.
C. Qualification Data: For installer.
D. Operation and Maintenance Data: upon Project Closeout to be submitted to Owner.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Security grilles shall be manufactured by a firm with a minimum of five (5) years experience in the fabrication and installation of security grilles. Manufacturer's proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five (5) years.
B. Installer Qualifications: Installation of security grilles shall be performed by an authorized representative of the manufacturer.
C. Single-Source Responsibility: Provide grilles, guides, motors, and related primary components from one manufacturer for each type of grille. Provide secondary components from source acceptable to manufacturer of primary components.
D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Refer to Section 01 31 00 – Project Management and Coordination.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages.

B. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

1.6 WARRANTY

A. Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace overhead coiling grilles that fail in materials or workmanship with specified warranty period.
   1. Warranty Period: 1 year/s from date of Substantial Completion

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Overhead Door Corporation
B. Architect approved equivalent by addendum

2.2 COILING STEEL DOOR (MANUAL)

A. Basis for Design: Stormtite 620 Series Manual Operated Coiling Steel Door
B. 24 ga. Galvanized Steel Curtain
C. Slat Profile – Flat, Type F-265
D. Finish (Interior/Exterior): Select from available colors
E. 24 ga. Galvanized Steel Hood
F. Windload: Texas Windstorm and IBC standards certified engineered.
G. Mount: Face of wall
H. Operation: Chain hoist
I. Springs: Standard 20,000 cycle
J. Weather Seals: Bottom Bar Astragal Guides and Hood baffles
K. Guides: 3 structural angles with manufacturer PowderGuard black finish
L. Bottom Bar: Extruded aluminum with weather seal
M. Lock: Chain keeper on chain hoist (option for interior pad lock assembly)
N. Warranty: 24 months + 3 year/20,000 cycle on door and operator system

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine locations to receive grilles. Notify Architect of any conditions that would adversely affect installation or subsequent use.
B. Take field dimensions and examine conditions of substrate, supports, and other conditions under which this work is to be performed.
C. Do not proceed with work until unsatisfactory conditions are all corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
B. Anchor to adjacent construction without distortion or stress.
C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
D. Fit and align door assembly including hardware, level and plumb, to smooth operation.

E. Position head and jamb weather stripping to contact door sections when closed. Secure in position.
F. Make wiring connections between power supply and operator and between operator and controls.

3.3 ADJUSTING AND CLEANING

A. Test grilles for full proper operation and adjust and lubricate as necessary to provide proper operation without binding or distortion.
B. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

3.4 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Instruct Owner’s personnel in proper operating procedures and maintenance schedule as per manufacturer’s written recommendations.

END OF SECTION

SECTION 08 71 00 – DOOR HARDWARE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section. Contractor shall provide and install all new door hardware in compliance with school district standards and from the school district's preferred hardware supplier. Provide closers and panic hardware for all egress doors adjusted to comply with TDLR requirements for push/pull pressures.

1.2 SUMMARY

A. Section includes furnishing and installing door hardware, thresholds, weatherstripping and seals.

1.3 RELATED SECTIONS

A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1. Related Sections include the following:

(a) Division 08 Section 08 11 13, "Hollow Metal Doors and Frames."

1.4 PERFORMANCE REQUIREMENTS

A. Furnish and install each door hardware item to provide proper operation and required function of every unit without binding or failure.

1. Interior Door Opening Force: Adjust hardware operation at interior non-fire-rated doors to provide an opening force not greater than 5 lbs. at a point 3" from latch, measured to leading edge of door.
2. Exterior and Fire Rated Door Opening Force: At exterior doors and fire-rated doors, adjust hardware opening force in small increments above the opening force required for interior non-fire-rated doors to close and latch the door.
3. Close Sweep Adjustment: Adjust closer sweep period so that from a 70° open position, door will take at least 3 seconds to move to a point 3" from latch, measured to leading edge of door.

1.5 SUBMITTALS

A. Submit manufacturer's technical product data for each item of hardware. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc.

B. Coordinate hardware with doors, frames and related work to ensure proper size thickness, hand, function and finish of hardware. If requested by Architect, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. Submit data and schedule at earliest possible date, particularly where acceptance of schedule must precede fabrication of other work (e.g. hollow metal frames) that is critical to the Project construction schedule.

1. Type, style, function, size and finish of each hardware item.
2. Name and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Hardware set location cross-referenced to both Drawing floor plan and door schedule indications.
5. Explanation of all abbreviations, symbols and codes in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.

C. Coordinate keying instructions, and keying information with the Owner. Deliver all keys and key control box to the Owner at address provided on Schlage Primus Face Sheet.

1.6 QUALITY ASSURANCE

A. Supplier Qualifications: A recognized finish hardware supplier who has been furnishing hardware in the Project's vicinity for a period of not less than 2 years, and who is, or employs, an experienced hardware consultant (AHC) who is available, at reasonable times during the course of the Work, for consultation about Project's hardware requirements, to Owner, Architect and Contractor.

B. Coordination and Schedules: Hardware units and usage specified in Part 2 of this Section and scheduled on the Drawings establish quality, quantity, function and finish required for each door opening. Review, coordinate and confirm that hardware specified for each opening is the proper function. In case of controversy, make appropriate notations of proposed changes from specified requirements on supplier's hardware schedule and request written clarification from the Architect prior to proceeding.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that comply with NFPA Standards No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals, whether listed in the Hardware Schedule or not. All hardware shall comply with UL 10C.

1. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

1.7 DELIVERY, STORAGE AND HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is the responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 WARRANTY

A. Special warranties:

1.	Door closers:	10 Years
2.	Exit Devices:	3 Years
3.	Automatic Door Operators:	2 Years
4.	Locks:	7 Years
5.	Cylinders:	3 Years

1.9 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Parts kits: Furnish manufacturer's standard parts kits for locksets, exit devices and door closers.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. General: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws. With each hardware item, furnish machine screws for installation into steel, and provide threaded to the head wood screws for installation into wood; all-purpose threads are not acceptable. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed screws to match the hardware finish. Provide concealed fasteners for hardware units that are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Provide through bolts for closer installation.

2.2 KEYING REQUIREMENTS

A. Keys and Keying:

1. All locks to accept final keying cylinder furnished by owner.

PART 3 – EXECUTION

3.1 PREPARATION

A. Mount hardware units at height indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect. Reinforce the attachment substrate for secure installation and adjust for proper operation. Provide clean, properly sized mortises and drilled holes for all mortised and surface applied finish hardware.

3.2 INSTALLATION

A. General: Install each hardware item in compliance with the manufacturer's instructions and recommendations.

B. Do not install surface-mounted items until finishes have been completed on the substrate. Before painter's finish is applied, remove all finish hardware, except prime painted items. After finish coats are dry, permanently replace and readjust finish hardware for proper operation.

C. Set units level, plumb, and true to line and location.

D. Cut and fit threshold and floor covers to profile of doorframes, with mitered corners and hairline joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for bolts and similar items, if any. Screw thresholds to substrate with No. 10 or larger stainless steel screws.

E. Set up Pre-installation, Post installation meeting and final punch list with manufacturer's agent and hardware installer.

3.3 ADJUSTMENT

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

END OF SECTION

SECTION 09 91 00 - PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contracts, including General and Supplementary conditions, apply to this section.

1.2 SUMMARY

A. Section includes:
   1. Work includes painting and finishing of interior and exterior exposed surfaces throughout the project, bare and covered pipes, and ducts (including color coding) hangers, exposed metal equipment surfaces under mechanical and electrical work, unless noted otherwise.
   2. Surface preparation of paints and stains on exterior and interior substrates specified under other sections of work.
   3. Application of paints and stains to interior and exterior surfaces specified in addition to other sections of work.
   4. Back Priming: Back prime all wood and cementitious materials prior to installation. Apply finish paint no more than 14 days from installation of primed.
   5. Pre-finished items shall NOT require field-applied finish work, including but not limited to, plastic toilet enclosure, partition systems, acoustical materials, mechanical and electrical equipment, light fixtures, switchgears, distribution cabinets, plastic laminated doors and casework, pre-finished door frames, unless noted otherwise.
   6. Concealed surfaces shall NOT require painting, including but not limited to, walls, ceiling, generally inaccessible areas, foundation spaces, furred area, utility tunnels pipe spaces, duct and elevator shafts, unless noted otherwise.
   7. Do NOT paint over code required labels, such as Underwriters Laboratories and Factory Mutual, equipment identification, performance ratings, name and/or nomenclature plates.

1.3 RELATED SECTIONS

A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 DEFINITIONS

A. Conform to definitions of terms in ASTM D19 in interesting requirements of this Section.
B. “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.5 SUBMITTALS

A. Material lists: Give the supplier’s name, products name, number and generic description of each proposed product and its use. Provide product data sheet and MSDS sheets for each product. Include VOC content.
B. Samples: Submit full range of colors, patterns, textures and finishes available for selection, including the following:
   1. Color chips: Provide complete duplicate sets of color chips for color selection.
   2. Small Applied Samples: Provide pieces of actual material on which paint with will occur with minimum dry mil thickness of specified paint. Approved samples will become standard, for which all work will be judged.
      (a) Provide painted 12” x 12” actual gypsum wallboard samples will be approved textures for Architect’s approval.

(b) On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color and texture is achieved.

(c) On actual wood surfaces, provide two 12" x 12" samples of natural and stained wood finish. Label and identify each as to location and application.

(d) On concrete masonry, provide two 8" square samples of masonry for each type of finish and color, defining filler, prime and finish coat.

(e) Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include as Area Summery with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

3. Sheen Samples: Provide full range of varying sheens when sheens are controllable by intermixing.

C. Installed Samples: Provide large size samples for approval. Approval samples may be left in place as part of the work.

D. One room and/or areas, as selected by the Architect, shall be painted with materials specified or accepted and applied directly from container, un-thinned. After acceptance by Architect, room and/or shall be standard of quality or entire project.

E. Certification:
1. Furnish a letter certifying that materials submitted are truly equivalent or better than those called out in the finish schedule.
2. Furnish certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs)

1.6 RESPONSIBLILITY OF COORDINATION.

A. Coordinate the work specified herein with the following work:
1. Review other sections of the Project Manual where prime paints are to be provided to ensure compatibility of total coating systems for various substrates.
2. Provide information to proceeding trades for proper preparation of substrate,
3. Inspect substrate before proceeding to verify proper preparation.
4. Notify Architect of any item to receive paint which may not be covered by a scheduled finish type. Architect will furnish appropriate specification.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility:
1. Provide primers and other undercoat paint from same manufacturer providing finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.

B. Materials:
1. Delivery and storage: Products shall be delivered in unopened containers bearing manufacturer’s labels intact and legible at time of use. Storage shall be in designated areas away from excessive heat and open flames and in accordance with manufacturer’s recommendations.

C. Quality or Grade:
1. Paints and coatings shall be the manufacturer’s highest professional quality material of types specified and shall be applied directly from containers in which material is purchased except where thinning is recommended by manufacturer and approved by Architect to suit intended use i.e. painting acoustical tile or panels without destroying their acoustical properties.

2. Thinners shall be those recommended by paint manufacturer's printed instructions.

D. Equipment:
   1. Spray equipment: Shall be the type recommended for the application and shall be maintained clean and in proper working order.
   2. Brushes, rollers, etc.
      (a) Shall be new of the various sizes recommended for each application
      (b) Shall be properly cleaned and stored in accordance with manufacturer's instruction at the end of each day.
      (c) Shall be replaced as often as necessary to attain the beast finish quality in the Work.

E. Application
   1. Applicator
      (a) Shall be person(s) or entity specializing in application of paints and coatings of types specified with minimum five (5) experiences.
      (b) Shall provide Owner and Architect a notarized certification that paint used is as specified.

   2. Application:
      (a) Shall not proceed on surfaces which are not suitable to be painted, until such surfaces have been corrected. Notify Architect in writing of which surfaces need to be corrected and their locations. Surfaces shall be corrected shall include, but not limited to:
         1) Damaged surfaces
         2) Oily, greasy, dusty, or excessive soiled surfaces.
         3) Non-dressed welds which will be exposed to view.
         4) Lack to touch-up where specified.
         5) Rusted or excessively deteriorated shop-primed painted surfaces.

      (b) Number of coats of each of several finishes shall be in accordance with detailed specification, which will produce first quality finish if properly applied. If number of coats specified fails to produce a finish acceptable to Architect, this Contractor shall apply additional coat or coats at his own expense until acceptable finish is achieved.

1.8 PRODUCT HANDLING

A. Deliver materials to the job site in original, new, and unopened packages and containers bearing manufacturer's name and label, and following information:
   1. Name or title of material
   2. Fed. Spec. number, if applicable
   3. Manufacturer's stock number and date of manufacturer
   4. Manufacturer's Name
   5. Content by volume, for major pigment and vehicle constituents
   6. Thinning instructions
   7. Application instructions
   8. Color name and number

B. Store only approved materials at the jobsite, and store in a suitable and designated area restricted to the storage of paint materials and related equipment.
C. Temperature in the storage area shall be between 40 degrees F and 110 degrees F. Open and mix all materials in the storage area.
D. Use all means necessary to protect materials before, during and after application and to protect the installed work and materials of all other trades.

E. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperatures are between 60 degree F and 90 degree F, unless otherwise permitted by paint manufacturer's printed instructions.
F. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degree F and 90 degree F, unless otherwise permitted by paint manufacturer's printed instructions.
G. Do not paint in snow, rain, fog, of mist, or when relative humidity exceeds 85 percent or to damp of wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated with temperatures limits specified by paint manufacturer during application and drying periods.

1.9 WARRANTY

A. The undertaking pf a painting subcontract will indicate that the subcontractor will warranty the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
B. Defects shall include but not be limited to the following:
    1. Discoloring noticeable by yellowing, streaking, blooming, changing color or darkening.
    2. Mildewing
    3. Peeling, cracking, blistering, alligatoring or releasing form substrate.
    4. Chalking or dusting excessively
    5. Changing sheen in irregular fashion
    6. Softening or becoming tacky
    7. Bubbling

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All paint material selected for coating systems for each type of surfaces shall be the product of a single manufacturer and shall, as a system, have a flame spread, fuel contribution, and smoke density test result of less then 25.

B. Manufacturers: Subject to compliance with requirements, provide products by on of the following as selected by the Architect:
    1. Benjamin Moore & Co.
    2. ICI Paints
    3. Kelly-Moore Paints
    4. PPG Architectural Finishes, Inc.
    5. Sherwin-Williams Company

2.2 MATERIALS

A. Paint and Coatings: Ready mixed, except for field catalyzed coatings; having good flow and brushing properties and consistent drying or curing behavior, sag and streak free. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
B. Accessory Materials: Linseed oil, turpentine, paint thinners and other materials recommended by paint and coatings manufacturer as necessary to achieve finishes manufacturer.
C. Patching and surface Preparation: Latex fillers as recommended by paint and coatings manufacturer.

2.3 COLORS

A. Color shall be as selected by Architect. Different colors may be selected for each room. Color pigments shall be pure, non-fading, applicable types to suit substrate and service indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that site environmental conditions are appropriate, and substrates are improper condition to receive Work of this Section.
B. Verify that shop applied primers are compatible with specified finish coats.
C. Measure moisture content of surfaces using an electronic moisture meter. Do not begin application of coatings unless moisture content of surfaces is below the following maximum values:
   1. Gypsum Soffits: 12%
   2. Plaster: 12%
   3. Masonry Surfaces: 12%
   4. Wood Surfaces: 15%
   5. Vertical Concrete Surfaces: 12%
   6. Horizontal Concrete Surfaces: 8%

3.2 ITEMS TO RECEIVE PAINT

A. Generally, all new items that are normally painted in any typical building, including but not limited to the following list:
   1. All ferrous metal
   2. All exterior galvanized metal
   3. All exterior wood
   4. All interior wood
   5. All primer coated hardware
   6. All exposed conduit, outlet boxes and electrical cabinets, excluding those located in mechanical rooms
   7. All exposed pipe, plumbing and ductwork, including those located mechanical rooms
   8. All metal grilles, except aluminum, unless otherwise indicated.
   9. All exposed gypsum, board surfaces, including al mechanical rooms.
   10. All exposed concrete masonry units (CMU), including all mechanical rooms.
   11. Miscellaneous other items which normally require painting or are scheduled to be painted.
   12. Consult plans, finish schedules, details, and specifications for other trades as all items usually field painted or finished will be considered as part of the Contract.
   13. All exposed structure scheduled or noted to receive paint.

B. All work where a coat of material has been applied must be inspected and approved by Architect before application of succeeding specified coat; otherwise no credit for coat applied will be given. Notify Architect when a particular coat has been completed for inspection and approval. Apply coats of material in strict accordance with manufacturer's specifications except where requirements of these specifications are in excess of manufacturer's requirements. Paint all sign exposed pipe and plumbing only after all mechanical work and tests have been completed.

3.3 PREPARATION

A. General: Surface must be clean to insure adhesion. Remove oil and grease with paint thinner. Wash off dirt with warm soapy water and rinse with clean water. Remove rust by wire brushing or sanding.
B. Wall surfaces must be dry before painting. Verify with moisture meter.
C. Unfinished Surfaces:

1. Wood: Sand smooth and apply one (1) coat of Primer has dried overnight, putty nail holes and cracks, then spot-prime putty with primer. Again, allow the primer to dry overnight, sand lightly and topcoat.
2. Masonry and concrete: Remove efflorescence or cement dust on masonry and concrete by etching with 10% solution or muriatic (Hydrochloric) acid. Flush off surface after etching with clean water, and paint while still damp. On surface where muriatic acid cannot be used to neutralize the efflorescence, remove the efflorescence by sanding, scraping or wire brush and apply a coat of Masonry Conditioner before painting. If efflorescence is not present, no primer is necessary on concrete and masonry surfaces. Fill voids and pores in concrete and haydite blocks with Latex Block Filler and allow to dry overnight before topcoating.
3. Iron and Steel: Prime with Metal Primer and allow to dry overnight before top coating.
4. Galvanized Metal: Prime with Galvanized Metal Primer and allow to dry overnight before topcoating.

3.4 APPLICATION

A. General: Surfaces to be finished must be clean, dry and free of dirt, oils, loose paint or other contamination that would adversely effect adhesion, protective properties or appearance of the coating.
B. Paint Thickness: Provide the following minimum dry film thickness per coat unless noted otherwise.
   1. Enamels on Metals: 1 mils
   2. Latex Paints: 1 mils
   3. Metal Primers: 1.5 mils
   4. Undercoats: 1.5 mils
   5. Oil paints: 1.5 mils
   6. Epoxy Paints: 1.5 mils
   7. Thickness test: use observation gauge that measures ”V” shaped scratch

C. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. Allow enamels and varnishes to dry 24 hours between coats. If enamel and varnishes are tacky after 24 hours, allow to additional time until finish is dried.
D. Leveling: Apply with proper consistency and quality so paint flows out to a level surface free of brush and roller marks, bubbles, dust, sags and holidays. Spread evenly.
E. Appearance: uniform color, texture, and sheen.
F. Neatness: Paint shall not be smeared, splatter or run over adjoining colors of materials. Cut-in lines shall be straight.
G. First coat shall be white, unless otherwise specified.
H. Moveable equipment and Furniture: Paint back side similar to exposed surfaces
I. Permanently fixed equipment and Furniture: Paint back side with prime coat only before final installation of equipment.
J. Interior Surface of Ducts: Paint interior surface where visible through registers and grilles with flat, non-specular black paint.
K. Access Panels, Removable or Hinged Covers: Paint back side to match exposed finish.
L. Exterior Doors: Finish top, edges and bottom similar to door face finish, unless noted otherwise.
M. Sand lightly between each succeeding enamel or varnish coat.
N. Omit first coat (primer) on metal surfaces which have been shop-primed, and touch-up painted, unless noted otherwise.
O. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration

   1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform, or feel sticky under

moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat

P. Prime Coats: Apply prime coat to material which is required to be painted or finished and which has not been prime coated by others

1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing

Q. Stipple Enamel Finish: Roll and redistribute paint to an even, fine texture. Leave no evidence of rolling such as laps, irregular texture, skid marks, or other surface imperfections.

R. Pigmented Finishes (Opaque): Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are not acceptable.

S. Transparent Finishes (Clear): Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats, unless noted otherwise.

T. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not complying with noted requirements.

3.5 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following material testing procedure, at any time and any number of times, during field painting period.

1. Engage the service of an independent testing laboratory to sample paint being used. Samples and materials delivered to project site will be taken, identified, sealed and certified in the presence of Contractor.
2. Testing will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
3. If test result shows material being used does not comply, Contractor may be directed to stop paint work, remove non-compliant paint, pay for testing, repaint surface coated with rejected paint; remove rejected paint from painted surface if upon painting with acceptable paint, the two coatings are incompatible.

3.6 CLEANING AND PROTECTION

A. Keep project premises free of painting-related debris. Collect materials that may constitute a fire hazard, place in closed metal containers, and remove daily form site.

B. Protect work adjacent to painting operations from paint splatters and spills. Immediately remove paint that falls on finished surfaces not scheduled to receive paint, using materials and techniques that will not be damaged affected surface.

3.7 SCHEDULE

A. Paint items indicated on the Drawings. If not indicated, the following schedule of typical painted items shall apply, but does not specifically include every item that is to receive paint, but rather shall establish a type and quality of finish for all items normally included in a complete paint job.

B. Exterior Surfaces:

1. Exposed Steel and Ferrous Metals
   (a) Finish: Semi-Gloss
   (b) Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66W00310
   (c) 1st Coat: Pro Industrial™ Acrylic Coating, B66W00651
   (d) 2nd Coat: Pro Industrial™ Acrylic Coating, B66W00651

2. Galvanized or Zinc Coated Metals
   (a) Finish: Semi-Gloss
   (b) Primer: Pro Industrial™ Pro-Cryl® Universal Primer, B66W00310
   (c) 1st Coat: Pro Industrial™ Acrylic Coating, B66W00651
   (d) 2nd Coat: Pro Industrial™ Acrylic Coating, B66W00651

C. Interior Surfaces:

1. Wood – Painted
   (a) Finish: Semi-Gloss
   (b) Primer: alkyd primer sealer
   (c) 1st Coat: alkyd enamel
   (d) 2nd Coat: alkyd enamel

2. CMU – Concrete Masonry Unit (High Moisture, Non-Shower Areas)
   (a) Finish: High Performance, Gloss or Egg-Shel
   (b) Primer: Heavy Duty Block Filler, B42W46
   (c) 1st Coat: Pro Industrial™ Water Based Catalyzed Epoxy,
   (d) 2nd Coat: Pro Industrial™ Water Based Catalyzed Epoxy,

END OF SECTION

SECTION 10 28 00 – TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to the Section.

1.2 SUMMARY

A. Section includes:
   1. Public-use washroom accessories.
      (a) Installation of Contractor Furnished and Installed toilet accessories:
         1) Grab Bar
         2) Mirror
      (b) Installation of the following Owner Furnished/Contractor Installed (OF/CI) toilet accessories):
         1) Toilet Tissue Dispenser
         2) Paper Towel Dispenser
         3) Soap Dispenser
         4) Towel/Clothes Wall Hook

   2. Warm air dryers
   3. Custodial Accessories

1.3 RELATED SECTION

A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements including requirements for cutout in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty

1.5 QUALITY ASSURANCE

A. Source Limitations: For listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities and for proper installation, adjustment operations, cleaning, servicing of accessories.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inchminimum nominal thickness.
C. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
D. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
G. Mirrors: ASTM 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Products: The design for accessories is based on products indicated manufactured by Bobrick Washroom Equipment, Inc. Subject to compliance with requirements, provide the named product or a comparable products by one of the following:
   1. A & J Washroom accessories, Inc
   2. American Specialties, Inc.
   3. Bradley Corporation
   4. General Accessory Manufacturing Co. (GAMCO).

B. REFERENCE DRAWINGS FOR SCHEDULED NUMBER AND MANUFACTURER

2.3 CUSTODIAL ACCESSORIES

A. Basis-of-Design Products: The design for accessories is based on products indicated manufactured by Bobrick Washroom Equipment, Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. A & J Washroom Accessories, Inc
   2. American Specialties, Inc.
   3. Bradley Corporation.
   4. General Accessory Manufacturing Co. (GAMCO).

   5. REFERENCE DRAWINGS FOR SCHEDULED NUMBER AND MANUFACTURER.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturer' written instructions, using fasteners appropriate to substrate indicate and recommended by unit manufacturer. Install units, level, plumb, and firmly, anchored in locations and at heights indicated.
B. Grab Bars: Install to withstand a downward load of at lead 250 lbs. when tested according to method in ASTM F 446. Where grab bars are mounted over back of toilet, General Contractor shall hold flush valve low.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inchminimum nominal thickness.
C. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
D. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
G. Mirrors: ASTM 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Products: The design for accessories is based on products indicated manufactured by Bobrick Washroom Equipment, Inc. Subject to compliance with requirements, provide the named product or a comparable products by one of the following:
   1. A & J Washroom accessories, Inc
   2. American Specialties, Inc.
   3. Bradley Corporation
   4. General Accessory Manufacturing Co. (GAMCO).

B. REFERENCE DRAWINGS FOR SCHEDULED NUMBER AND MANUFACTURER

2.3 CUSTODIAL ACCESSORIES

A. Basis-of-Design Products: The design for accessories is based on products indicated manufactured by Bobrick Washroom Equipment, Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. A & J Washroom Accessories, Inc
   2. American Specialties, Inc.
   3. Bradley Corporation.
   4. General Accessory Manufacturing Co. (GAMCO).

   5. REFERENCE DRAWINGS FOR SCHEDULED NUMBER AND MANUFACTURER.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturer' written instructions, using fasteners appropriate to substrate indicate and recommended by unit manufacturer. Install units, level, plumb, and firmly, anchored in locations and at heights indicated.
B. Grab Bars: Install to withstand a downward load of at lead 250 lbs. when tested according to method in ASTM F 446. Where grab bars are mounted over back of toilet, General Contractor shall hold flush valve low.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 44 00 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to the Section.

1.2 SUMMARY
- A. Section includes:
  1. Fire Extinguishers, cabinets, and accessories where indicated on Drawings

1.3 RELATED SECTIONS
- A. Coordinate Work of this Section with work of other sections, including Division 01 Sections, as required to properly execute the work and as necessary to maintain satisfactory progress of the work.

1.4 QUALITY ASSURANCE
- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Standards for Portable Fire Extinguishers”.
- B. Provide portable fire extinguishers with comply with UL standards and are labeled by UL.
- C. Provide portable fire extinguishers and cabinets by one manufacturer, unless otherwise acceptable by Architect.

1.5 SUBMITTALS
- A. Product Data: Submit manufacturer’s technical data and installation instructions for all fire extinguishers and cabinets required.
- B. Shop Drawings: For fire extinguisher cabinets include rough-in dimensions and details showing mounting methods, relationships to surrounding construction door hardware cabinet type and materials trim style and door construction style, and materials.
- C. Samples: Where color selections are required include color chart showing full range of manufacturer’s standard colors and designs available.

PART 2 – PRODUCTS

2.1 MOUNTING UPPER-LOWER BRACKETS
- A. Provide manufacturer’s standard bracket designed to prevent accentual dislodgement of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer’s standard plated finish.

PART 3 – EXECUTION

3.1 EXAMINATION
- A. Verify that dimensions are correct and project conditions are suitable for installation.
- B. Examine support and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting corrected.
- C. Notify Architect in writing of unsatisfactory conditions prior installation. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION
- A. Install items included in this Section in locations and heights indicated on drawings, or at heights complying with applicable regulations of governing authorities

B. Securely fasten cabinet to substrate construction, square and plumb, to comply with manufacturer's instructions.

END OF SECTION

SECTION 12 67 23 – BENCHES

PART 1 – GENERAL

1.1 SUMMARY
- A. Section includes:
  1. Outdoor bench with aluminum seat.

1.2 RELATED SECTIONS
- A. Coordination:
  1. 04 05 13 Masonry Mortar and Grouting.
  2. 04 20 00 Unit Fabrications.

1.3 DESIGN REQUIREMENTS
- A. Locate position of stationary bench on the drawings.
- B. Verify that site conditions are adequate to support loads imposed by product specified.

1.4 SUBMITTALS
- A. Comply with 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; troubleshooting guide; parts list.

1.5 QUALITY ASSURANCE
- A. Single Source Responsibility: Provide stationary bench from single manufacturer.
- B. Manufacturer's Qualifications: Minimum of 5 consecutive years of experience manufacturing benches like specified.
- C. Installer's Qualifications: Contractor experienced with outdoor bench installation, concrete work, masonry work, and related works.

1.6 DELIVERY, STORAGE AND HANDLING
- A. Delivery: Delivery materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Keep temporary protective coverings in place.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.7 WARRANTY
- A. Provide 1-year warranty against defects in materials and workmanship, unless otherwise specified.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
- A. Manufactured by:
  1. Pilot Rock
  2. Gill Athletics, Inc.

2.2 COMPONENTS
- A. Seating
  1. Extruded Aluminum Plank
  2. 6'-0" Long

- B. Frame

1. Formed and welded 10 gage steel channel frames.

C. Seat Finish
   1. Clear Anodized Aluminum
   2. Powder Coat
      (a) Blue, Black, Green, Brown, Yellow, Red, Gray, Burgundy, Tan

D. Frame Finish
   1. Galvanized
   2. Powder Coat
      (a) Blue, Black, Green, Brown, Yellow, Red, Gray, Burgundy, Tan

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine area to receive stationary bench. Notify Architect in writing of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install stationary bench in accordance with manufacturer's instructions at locations indicated on the Drawings.
B. Install equipment plumb, level, straight, square, accurately aligned, correctly located, to proper elevation, and secure.
C. Install equipment using manufacturer's recommended fastening methods.
D. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
E. Remove and replace damaged components that cannot be successfully repaired, as determined by the Architect.

3.3 ADJUSTING

A. Adjust stationary bench to plumb and level as appropriate.

END OF SECTION

SECTION 13 34 19 – METAL BUILDING SYSTEMS
(Pre-Engineered Building Structural and TDI)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Project Manual sections, apply to work of this section.
- B. Reference structural drawings and notes for additional requirements including exposure classification and deflection of system. Notify architect and engineer of conflicts between the two.

1.2 DESCRIPTION
- A. Furnish and install purlins, girts and roof framing, wind bracing, roof panels, gutters, down spouts, trim pieces and framing etc. to provide a complete structure as shown on drawings. Pre-engineered Building supplier shall provide continuous bridging and sag rods for all roof purlins and wall girts including those where attached to Class A steel frames supplied by others. Manufacturer's standard components are acceptable, provided they conform to design appearance shown and to noted size & configuration requirements. Ref. Structural Drawings.
- B. Furnish and install pre-engineered and galvanized steel framed walkway covers with standing seam room to match building (optional matching Kynar 500 “R” panel roof).
- C. Furnish and install pre-engineered window shade devices with matching Kynar 500 finish.
- D. Provide necessary anchor bolts and their layouts.
- E. Entire structure to be fully red-iron paint coated after fabrication including purlins, anchors, rods, bolts, etc. Immediately recoat on job site after tightening bolts or damaging finishes.

1.3 QUALITY ASSURANCE
- A. Design Criteria:
  1. For structural steel members, comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."
  2. For light gauge steel members comply with AISC "Specification for the Design of Cold-Formed Steel Structural Members".
  3. Design primary and secondary members and covering for applicable loads and combination of loads in accordance with Metal Building Manufacturer's Association "Recommended Design Practices Manual".
  4. For welded connections comply with AWS "Structural Welding Code".
  5. The International Building Code
  6. Texas Insurance Regulations for Windstorm Design Inland II – 110 MPH Winds and exposures per Texas Department of Insurance Standards.
  7. Comply with Factory Mutual Standards.
  8. Design Loads: See Structural Drawings
  9. BUILDING FRAME DEFLECTION L/240.

1.4 ACCEPTABLE MANUFACTURERS
- A. Schulte Building Systems
- B. Red Dot
- C. Midwest-Metallic
- D. Equals submitted and given approval prior to receipt of bids.

1.5 SUBMITTALS
- A. Submit complete erection drawings showing anchor bolt setting plan, sidewall, end wall and roof framing, covering and trim details and accessory installation details.
- B. Submit Certification signed by a Professional Engineer, registered in the State of Texas, verifying that the building design meets loading requirements and codes of authorities having jurisdiction but not less than the Texas Windstorm requirements.
- C. Submit engineering data showing compliance with required building and insurance codes.

1.6 DELIVERY, STORAGE AND HANDLING
- A. Deliver and store prefabricated components, sheets, panels, etc., so they are not damaged or deformed.
- B. Exercise care in unloading, storing and erection of wall and roof panels to prevent bending,

warping, twisting and surface damage.

C. Stack materials on platforms or pallets covered with suitable weather tight ventilated cover. Store so that water accumulation will drain freely and panels are not in contact with materials that might cause staining.

1.7 WARRANTY

A. Finish: Furnish formed 24 Gauge Kynar 500 coated trapezoidal double lock standing seam roof panel and “R” formed wall panel manufacturer’s written warranty covering factory applied exterior finish from any failure for a period of Twenty (20) years from date of substantial completion.

B. Weather tightness: Provide 20 year weather tight warranty against roof leaking including 100% cost of materials and labor to complete repairs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot Rolled Structural Shapes: Comply with ASTM A36 or A529.

B. Steel Tubing or Pipe: Comply with ASTM A500, Grade B, ASTM A501 or A53.

C. Steel Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A529, A570 or A572.

D. Steel Members Fabricated by Cold Forming: ASTM A607, Grade 50.

E. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A366 or ASTM A568.

F. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A568 or ASTM A569.

G. Structural Quality Galvanized Steel Sheet: Comply with ASTM A446 with G90 coating complying with ASTM A525. Grade to suite manufacturer's standards.

H. Silicone Sealant: Single-component elastomeric silicone sealant complying with FS TT-S-001543, Class A, non-sag and ASTM C920. Type S, Grade NS, Class 25, Uses G, A and O. Provide low modulus nonacid curing type except if channel surfaces are porous.

I. Thermal Insulation: 6” Glass fiber blanket complying with ASTM C991, or 0.5 lb. Per cu. ft. density, thickness as shown on drawings with U.L. flame spread classification of 25 or less, 2 Inch wide continuous vapor-tight edge tabs and vinyl film vapor barrier with joints taped sealed tight and banded where exposed in ceiling installations Insulation Retainer Strips: 26 gauge formed galvanized steel colored to match insulation facing.

J. Thermal Blocks: as required by manufacturer.

K. Shop Primer: Red Iron full coated primer all components.

L. Continuous Sealant Strip: Provide continuous factory applied removable protective film sealant strip to all interior flat wall and ceiling panels, trim and other areas requiring that these installations are air-tight.

2.2 STRUCTURAL FRAMING

A. Frames to be hot rolled structural steel, factory welded shop painted built-up AI@ shape consisting of tapered or parallel flange beams and parallel flange columns, furnished with attachment plates, bearing plates and splice members. Red-Iron primer coat after fabrication.
   1. PROVIDE GALVANIZED FRAMES AT WALKWAY COVERS

B. Roof Purlins and Wall Girts: Shop painted, rolled formed AC@ or AZ@ shape sections fabricated from 16 gauge galvanized steel. Purlins spacers fabricated from 14 gauge cold-formed steel Red Iron primer coated after fabrication. Reference structural for special purlin conditions.
   1. PROVIDE GALVANIZED ROOF PURLINS/TRIM FRAMES AT WALKWAY COVERS.

C. Eave Struts: Unequal flange AC@ shape sections to provide adequate back-up for both wall and roof panels, fabricated from 16 gauge roll formed steel Red Iron primer coated after fabrication.
   1. PROVIDE GALVANIZED ROOF EAVE STRUTS AT WALKWAY COVERS.

D. Secondary End Wall Structural Members: 14 gauge cold-formed steel.

E. Wind Bracing: Furnish wind bracing as required to meet standards set forth in Design Criteria outlined in this section.

F. Bolts: Provide shop-painted bolts for structural members except where structural members are in contact with roofing or siding panels use zinc or cadmium plated bolts. Paint with Red Iron primer after installation and cleaning.

G. Reference Structural Drawings for Governing Requirements

2.3 ROOFING, EXTERIOR SIDING PANELS, INTERIOR WALL PANELS

A. Roofing Panels: Roll formed 24 gauge trapezoidal double lock conceal mounted standing seam *Kynar 500* coated panels with intermediate striations designed for Seaward – 130 MPH wind load conditions as described in this section and structural drawings and provide insurance certification for Texas Department of Insurance upon completion of project. Roof panel color selected from manufacturer's standard chart. (Reference structural drawings and notes)

B. Unfaced Fiberglass Insulation: Install against bottom of roof deck with thermal blocks at purlins.

C. Vinyl Faced Insulation: 6" R-19 installed to bottom of unfaced batt insulation by use of taped joints and vinyl bands secured to bottom of purlins. Install draped between wall purlins.

D. Exterior Wall Panels: Roll formed 24 gauge "R" Kynar coated steel "R" panels with intermediate minor support ribs designed for Seaward 130 MPH windload conditions as described in this section and structural drawings. (Minimum .15 to .25 mil fluorocarbon color coating) color selected from manufacturer's standard colors (Contractor option to utilize Galvalume coated panels where exposed behind masonry walls).

E. Interior Liner Panels: Roll formed 26 gauge acrylic or polymer coated steel panels with intermediate ribs. Color to be selected from manufacturer's standard acrylic or polymer colors.

F. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivers, self-locking bolts, end –weld studs and other fasteners designed to assure that the finished installation complies with the UL other applicable loading conditions without causing damage to panels or structure. All items pre-finished to match roof/wall panel and touched-up after tightening as required.
   1. Provide metal-backed pre-finished (to match wall panel color) neoprene washers under heads or fasteners bearing on weather side of panels.
   2. Locate and space fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
   3. Space fasteners in compliance with the pattern and spacing guide dictated by the UL design and such that the finished roof and wall panel installation is in compliance with Texas Windstorm Requirements.

G. Certification: Provide, at the completion of the project, certification that the building exterior wall and roof panels comply with the International Building Code and the Texas Insurance Windstorm Requirements.

H. Accessories: Provide flashing, closers, fillers, trim, ridge caps, fascias, etc. of the same material and finish as roof and wall panels.

I. Closure Strips: Manufacturer's standard closure strips installed or necessary to ensure and guarantee weather tight condition.

J. Sealing Tape: Pressure sensitive 100% solid grey polyisobutylene compound or as recommended by manufacturer with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½" wide and 1/8" thick minimum.

K. Gutters: 24 gauge Kynar coated steel formed gutters with end pieces, backer splice plated, rivets, mastic, etc. for waterproof fabrication. Provide supports minimum 26" o.c. of same material and finish as gutter.

L. Downspouts: 24 gauge Kynar coated steel formed downspouts with joiners, elbows and straps to match gutter. Join sections with 1-1/2" telescoping joints and fasteners designed to hold downspouts 1" from wall. Provide plate connection to gutter set in mastic and rivets for watertight connection. Manufacturer design gutters and downspouts for heaviest applicable rain load conditions.

M. Window Shade Device : Aluminum tubing welded, and secured to building frame with stainless steel anchor plates.

2.4 Exterior Pressed Steel Doors: Reference Section 08 13 13 for pressed steel doors.

2.5 Exterior Louvers: Reference Section 08 91 00

PART 3 - EXECUTION

3.1 ERECTION

A. Framing: Erect framing true to line, level, plumb, rigid and secure. Level base plate to a true even plane with full bearing to supporting structures, set with double-nut anchor bolts.
B. Reference structural drawing notes for engineering, spacing and certification of structural members for windstorm requirements.
C. Use a non-shrinking grout to obtain uniform bearing. Moisture cure grout for not less than 7 days after placement.
D. Purlins and Girts: Provide rake purlins with tight fitting closure channels and fascia. Locate and space wall girts to suit door height and as shown on drawings. Secure purlins and girts to structural frames and hold rigidly to a straight line by use of sag rods. Reference structural drawing notes for special conditions and spacing.
E. Bracing: Provide bracing in roof and wall as required by design criteria.
F. NOTE: Bracing will not conflict with architectural details (diagonal wall bracing, wind bents, etc.)
G. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed by equipment furnished under mechanical and electrical work. Securely attach to structural frames.
H. Apply finished paint coat: Prior to installing metal roof and wall panels, contractor shall apply finished paint to all steel structural surfaces.

3.2 ROOFING AND SIDING

A. The roof and siding installer shall complete the installation in complete compliance with the requirements of the manufacturer, engineer and applicable codes and regulations.
   1. General: Avoid Apanel creep@ or application not true to line. Protect factory finishes from damage. Field cutting of panels by torch is not permitted.
      (a) Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with neoprene or other closures to exclude weather. (Unique application condition requiring installation of unfaced batt insulation and thermal blocks at purlins with vinyl faced below compressing unfaced against roof deck by use of taped joints and vinyl bands/straps secured to bottom of purlins).
      (b) All work shall be done such that the finished building can be certified in compliance with the Texas Insurance Windstorm Requirements.
B. Roof Panels: Install roof panels from ridge to eave in one continuous sheet.
   1. Fasten to purlins with approved fastener and neoprene washer to comply with all manufacturer and engineering requirements and weather tight warranty. Install factory-caulked cleats at standing-seam joints.
   2. Do not over torque attachment devices.
C. Exterior Wall Panels:
   1. Apply sealant continuously between base angle and concrete for seal.
   2. Align bottom of wall panels and fasten with blind rivets, bolts or self-tapping screws. Fasten flashings and trim with self-tapping screws and door frames with machine screws or bolts. Provide panels in continuous sheet from eave or rake to base angle.
   3. Install screw fasteners with tool having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
   4. Provide weatherproof escutcheons for pipe and conduit penetrations of exterior walls.
D. Interior Wall Panels and Trim:
   1. Review manufacturer's recommendations to create air-tight wall installation and protecting factory applied adhesive strip, installing attachment devices for sure fit and applying bent formed trim over adhesive strips and attachments so-as to assure a tight fit and adhesive strip adhesion.

3.3 GUTTERS, DOWNSPOUTS, FLASHING AND TRIM

A. Install all gutters, downspouts, flashing and trim in compliance with manufacturer's standard details including installation of mastic and caulking for watertight condition.
B. Maintain all work smooth and in constant alignment.

C. Leaks at gutter and downspout/gutter seams shall be immediately repaired.

3.4 CLEANING AND TOUCH-UP:

A. Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects with same material as shop primer. Apply touch-up matching paint product where damaged.

END OF SECTION 13120

Section 22 00 00 – Plumbing General Provisions

PART 1 GENERAL

1.1 SUMMARY

A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.

1.2 SCOPE OF WORK

A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including plumbing systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the this Division have been included if he chooses to accept separate bids.

B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.

C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.

D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.

This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

1.3 DEMOLITION

A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.

B. Contractor shall coordinate demolition with owner. The Owner shall have “First Right of Refusal” regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor’s expense.

C. Contractor shall coordinate all work with general contractor and phase work as required by project.

D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.

E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.

F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.

G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.

H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

1.4 GROUNDS AND CHASES

A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.5 CUTTING AND PATCHING

A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimbled without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.6 FILL AND CHARGES FOR EQUIPMENT

A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

1.7 MACHINERY GUARDS

A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.

B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2 inch minimum diameter opening in fan belt guards housing for tachometer.

1.8 REPAIRING ROADWAYS AND WALKS

A. Where this Contractor cuts or breaks roadways or walks, in order to lay piping, he shall repair or replace these sections to meet the Architect's approval.

1.9 EXCAVATION AND BACKFILL

A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.

B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.

C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.

D. Material to be excavated is “unclassified”. No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.

E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.

F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer’s recommendations, whichever is lower:

1. 1-Foot Minimum Cover: Sanitary sewer, storm drainage, industrial waste, acid waste.

2. 3-Feet Minimum Cover: Domestic water, fire line.

G. Underground domestic water piping and fire line piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.

H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.

I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.

J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent

of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.

K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

1.10 NOISE AND VIBRATION

A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

1.11 PAINTING

A. All painting shall be by the General Contractor's Painting Sub-Contractor. All pipe, pipe covering, equipment, supports, hangers, etc. exposed in the building or equipment room shall be painted. This Contractor shall prepare the surface of the material to receive the first coat of paint.

B. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded.

C. All piping shall be color coded per the following:

1.	Natural Gas Piping (Exposed in Mechanical Room)	Yellow
2.	Natural Gas Piping (Outdoor, Roof, Exterior of Building)	Yellow
3.	Natural Gas Piping (Exposed in Building)	Black
4.	Storm Drain Piping (Exposed in Building)	Black
5.	Sanitary Sewer Waste & Vent (Exposed in Building)	Black

1.12 CLEANING AND ADJUSTING

A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.

B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.

C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.

D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.

E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

1.14 GUARANTEE

A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

1.15 LOCAL CONDITIONS

A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.

B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.

C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.16 PERMITS, INSPECTIONS AND TESTS

A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.

B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.

C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.

D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.

E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

1.17 CODES AND STANDARDS

A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and the State in which this project is being constructed, including the State Fire Marshal and the State Department of Health. Modifications required by these authorities shall be made without additional charge to the Owners. The Contractor shall report these modifications to the Architect and secure his approval before work is started.

B. In addition to the codes heretofore mentioned, mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:

1. American Society of Heating, Refrigeration and
2. Air Conditioning Engineers (ASHRAE)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA)
5. American Society of Mechanical Engineers (ASME)
6. American Gas Association (AGA)
7. International Building Code (IBC)
8. International Mechanical Code (IMC)
9. International Plumbing Code (IPC)
10. International Fuel Gas Code (IFGC)
11. Underwriters Laboratories (UL)
12. Life Safety Code (NFPA 101)
13. State Sanitary Code
14. Louisiana State Uniform Construction Code Council (LSUCCC)
15. Facility Guidelines Institute “Guidelines for Design and Construction of Hospitals and Outpatient Facilities” (2014 Edition)

C. Materials, equipment and accessories installed under this Contract shall conform to the rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. Materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.

D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.

E. Unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped.

Furnish shop certificates for each vessel.

1.18 REVIEW OF MATERIALS

A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.

B. Submission shall include the manufacturer's name, model number, rating table and construction features.

C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.

D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.

E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.

F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.

G. Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract. Any drawings not approved shall be resubmitted until they are approved.

H. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies submissions will not be accepted.

1.19 MINOR DEVIATIONS

A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The

contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.

B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.

C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

1.20 AS-BUILT RECORD DRAWINGS

A. The Contractor shall obtain at his cost, two sets of blue line prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.

B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.

C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.

D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.

E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.

F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.

G. The following requirements apply to all "As-Built" drawings:

1. They shall be maintained at the Contractor’s expense.
2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
3. Additional drawings shall be provided as necessary for clarifications.
4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.

5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

1.21 REQUIRED SHOP DRAWING SUBMITTALS

A. Provide the following shop drawing submittals:
   1. All Valves.
   2. Pipe and pipe fittings.

PART 2 PRODUCTS

2.1 WELDING PRODUCTS

A. Refer to individual Division 22 sections for welding products, pipe, tube and fitting materials and joining methods.

PART 3 EXECUTION

3.1 MANUFACTURER'S DIRECTION

A. The contractor shall install and operate equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.

B. Store equipment in a clean, dry place protected from other construction. While stored, maintain factory wrapping or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

3.2 EQUIPMENT LABELS

A. Provide equipment labels for water heaters and mixing valves. Labels shall have permanent laminated construction secured to equipment.

3.3 PIPE LABELS

A. Provide pipe markers and directional arrows on all piping in mechanical equipment rooms, or which is exposed in building, and on both sides of all valves located above ceiling. Markers shall be as manufactured by W.H. Bradley Co., Marking Services Inc. or the equivalent. All letters shall be color-coded and sized as recommended by OSHA. Samples of the type of letters to be used shall be submitted with shop drawings. Piping shall be color-coded.

B. Pipe markers with arrows shall indicate lines content and shall be located 20 feet on center and at each change of direction of line. Identification bands shall be color coded to match pipe markers and shall be provided 10 feet on center. Pipe identification markers shall be taped at each end and shall be taped around the entire circumference of pipe.

C. The following Piping shall be identified:

1. Argon

2. C25

3.4 CLEANING AND SERVICE

A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;

B. Clean piping, fixtures, cleanout covers, floor drain covers, etc. and leave the entire installation in good working order.

C. Adjust flush valves and faucets to allow for proper operation.

END OF SECTION 22 00 00

Section 22 12 35 – Welding Gas Distribution and Piping

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SERVICE

A. Contractor shall include routing gas main from manifold/tank storage and throughout project as indicated on Drawings.

B. Contractor shall provide gas pressure regulator downstream of the meter to provide adequate gas pressure to equipment furnished in project. Coordinate gas supply pressure and equipment supply pressure requirements with equipment manufacturers.

1.3 SUMMARY

A. Section Includes:

1. Gas pipes, tubes, and fittings in the buildings.

B. Product Data: For piping, transition fittings and dielectric fittings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 MANIFOLDS

A. ARGON MANIFOLD / REGULATOR (CYLINDER BOTTLES LOCATION)

1. Victor SSIN-SR450ME-6RW-6LW-580-24FTCV, single manifold system, single source of supply via a primary and reserve bank of cylinders. Manifold system shall be complete with the following item: master shut-off valve, individual station shut-off valves, 3/4" NPT(F) outlet, headers (7/8" brass pipe with bar stock tees), brazed construction for maximum leak prevention, end capped to accommodate future expansion needs, and 24" pigtail flexible lines with check valve. Maximum inlet 3,000 PSI, maximum temperature range 140ºF, and minimum temperature range 0 degrees F. Verify manifold system configuration with plans prior to ordering.

B. C25 (CO2) MANIFOLD / REGULATOR (CYLINDER BOTTLES LOCATION)

1. Victor SSIN-SR450ME-6RW-6LW-580-24FTCV, single manifold system, single source of supply via a primary and reserve bank of cylinders. Manifold system shall be complete with the following item: master shut-off valve, individual station shut-off valves, 3/4" NPT(F) outlet, headers (7/8" brass pipe with bar stock tees), brazed construction for maximum leak prevention, end capped to accommodate future expansion needs, and 24" pigtail flexible lines with check valve. Maximum inlet 3,000 PSI, maximum temperature range 140ºF, and minimum temperature range 0 degrees F. Verify manifold system configuration with plans prior to ordering.

2.3 REGULATOR / FLOW METER

A. ARGON/C25(CO2) REGULATOR/FLOWMETER (WELDING SHOP)

1. Victor HRF-1425-034 (Profax PXRF1430-034) regulator/flowmeter, brass body, flow meter range 10-60 scfh, 3,000 PSIG maximum inlet pressure, teflon seat, 5/8"-18RH(F) outlet connection, and pressure gauge. Western QDB-33 quick disconnect inert gas regulator to hose, brass construction, demand valve on supply side creates a positive seal when fitting is not connected, spring loaded locking mechanism responds to fingertip action and achieves a gas-tight connection, and double seal socket connection on second seal provides added safety protection. Provide two (2) regulator flowmeters for each welding booth, one (1) regulator flow meter for each gas type, total of 30 welding booths. GNS RH3127 1/4 x 10' fitted inert single line green hose for argon/C25. Provide one (1) hose for each welding booth, total of 30 welding booths.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of natural gas distribution piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.2 HANGER AND SUPPORT INSTALLATION

A. Provide pipe hangers and support products. Install as per the following:

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

3.3 IDENTIFICATION

A. Identify system components.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. All low pressure gas piping shall be tested with a 10" mercury column for thirty (30) minutes.

b. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

c. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

d. Prepare reports for tests and for corrective action required.

B. Gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Gas piping, C25 and Argon; NPS 4 and smaller, shall be the following:

1. Gas piping on the building interior of the building shall be standard black steel, Schedule 40, National Tube Co., or equal. Fittings which are 2 inches and below shall be malleable screw fittings. Piping above 2 inches shall be electrically welded utilizing weld fittings.

2. Gas piping on the exterior of the building and on the roof shall be the same as specified above, except to be coated with Scotch-Kote polyethylene coating (20 mil) and all joints weatherproofed with two coats of field applied Scotch-Kote wrapping tape.

END OF SECTION 22 12 35

Section 23 00 00 – Mechanical General Provisions

PART 1 GENERAL

1.01 SUMMARY

A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.

1.02 SCOPE OF WORK

A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including HVAC systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the this Division have been included if he chooses to accept separate bids.

B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.

C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.

D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions that would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.

E. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

1.03 DEMOLITION

A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.

B. Contractor shall coordinate demolition with owner. The Owner shall have “First Right of Refusal” regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor’s expense.

C. Contractor shall coordinate all work with general contractor and phase work as required by project.

D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.

E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.

F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.

G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.

H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

1.04 GROUNDS AND CHASES

A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.05 CUTTING AND PATCHING

A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimbled without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.06 FILL AND CHARGES FOR EQUIPMENT

A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

1.07 MACHINERY GUARDS

A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.

B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2 inch minimum diameter opening in fan belt guards housing for tachometer.

1.08 REPAIRING ROADWAYS AND WALKS

A. Where this Contractor cuts or breaks roadways or walks, in order to lay piping, he shall repair or replace these sections to meet the Architect's approval.

1.09 EXCAVATION AND BACKFILL

A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.

B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.

C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.

D. Material to be excavated is “unclassified”. No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.

E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.

F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer’s recommendations, whichever is lower:

    1. 3-Feet Minimum Cover: Chilled Water lines, Heating Hot Water Lines, Condenser Water Lines.

G. Underground piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.

H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.

I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.

J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.

K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

1.10 WELDING

A. Weld piping and above grade steel tanks in accordance with qualified procedures using performance qualified welders and welding operators. Qualified procedures and welders in accordance with ASME Section IX. Welding procedures qualified by others and welders and welding operators qualified by another employer may be accepted as permitted by ANSI B31.1. Notify the A/E 24 hours in advance of tests, and perform the tests at the work site if practicable. Furnish A/E with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. Apply welders or welding operators assigned symbols near each weld they make as permanent record.

1.11 NOISE AND VIBRATION

A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

1.12 PAINTING

A. All painting shall be by the General Contractor's Painting Sub-Contractor. All pipe, pipe covering, equipment, supports, hangers, etc. exposed in the building or equipment room shall be painted. This Contractor shall prepare the surface of the material to receive the first coat of paint.

B. All steel hydronic piping shall have two (2) coats of rust inhibitor primer applied prior to insulating.

C. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded.

D. All piping shall be color coded per the following:

1. Ductwork (Exposed in Building) Black

1.13 CLEANING AND ADJUSTING

A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.

B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.

C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.

D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.

E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

1.15 GUARANTEE

A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

1.16 LOCAL CONDITIONS

A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.

B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.

C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.17 PERMITS, INSPECTIONS AND TESTS

A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.

B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.

C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.

D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any

portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.

E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

1.18 CODES AND STANDARDS

A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and State in which this project is being constructed, including the State Fire Marshal and the State Board of Health. All modifications required by these authorities shall be made without additional charge to the Owners. The Mechanical Contractor shall report these changes to the Architect and secure his approval before work is started.

B. In addition to the codes heretofore mentioned, all mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:

1. American Society of Heating, Refrigeration and
2. Air Conditioning Engineers (ASHRAE)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA)
5. American Society of Mechanical Engineers (ASME)
6. American Gas Association (AGA)
7. International Building Code (IBC)
8. International Mechanical Code (IMC)
9. International Plumbing Code (IPC)
10. International Fuel Gas Code (IFGC)
11. Underwriters Laboratories (UL)
12. Life Safety Code (NFPA 101)
13. State Sanitary Code
14. Louisiana State Uniform Construction Code Council (LSUCCC)
15. Facility Guidelines Institute “Guidelines for Design and Construction of Hospitals and Outpatient Facilities” (2014 Edition)

C. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.

D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.

E. All unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel.

1.19 REVIEW OF MATERIALS

A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.

B. Submission shall include the manufacturer's name, model number, rating table and construction features.

C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.

D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.

E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.

F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.

G. If contractor submits hard copies, Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract.

H. This information shall be bound in plastic hardbound notebooks with the job name on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies shall not be acceptable. We prefer electronic submissions sent via E-Mail.

I. Required shop drawing submittals shall include but are not limited to the following:

1. Grilles, registers, diffusers and louvers.
2. Ductwork and duct sealer.
3. Duct insulation and accessories.
4. Controls/Building Automation System.
5. Exhaust fans.
6. Double wall spiral pipe and fittings.
7. Manual Dampers, Motorized Dampers and Control Dampers.
8. Actuators.
9. Test and Balancing Agency (including forms).

1.20 COORDINATION DRAWINGS

A. Submit three (3) black line prints of all mechanical room layouts showing locations of all equipment, piping, etc. to insure all will fit in space provided. Submit drawings at 1/4" scale. Layouts shall include equipment submitted on project to scale on plans.

B. Submit coordination drawings with the respective equipment shop drawings.

1.21 MINOR DEVIATIONS

A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.

B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.

C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

1.22 AS-BUILT RECORD DRAWINGS

A. The Contractor shall obtain at his cost, two sets of blackline prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.

B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.

C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.

D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.

E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.

F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.

G. The following requirements apply to all "As-Built" drawings:
   1. They shall be maintained at the Contractor's expense.
   2. All such drawings shall be done carefully and neatly, and in a form approved by the Archtect/Engineer.
   3. Additional drawings shall be provided as necessary for clarifications.
   4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
   5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

PART 2 PRODUCTS

2.01 HVAC SYSTEM PRODUCTS

A. Refer to individual Division 23 sections for mechanical products, controls, fans, pipe, tube and fitting materials and joining methods.

PART 3 EXECUTION

3.01 MANUFACTURER'S DIRECTION

A. The contractor shall install and operate all equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.

3.02 EQUIPMENT LABELS

A. Provide equipment labels for HVAC Equipment. Labels shall have permanent laminated construction secured to equipment.

3.03 CLEANING AND SERVICE

A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;

B. Inspect, clean and service air filters and strainers immediately prior to final acceptance of project.

C. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced condition, check the charge and modify it for proper operation as required.

D. Place mechanical systems in complete working order. Clean equipment and piping materials thoroughly returning to "as new" condition prior to request for substantial completion.

E. Remove excess materials and debris from mechanical rooms and drain pans. Broom clean areas. Thoroughly clean ductwork inside and outside before air devices (diffusers, grilles, etc.) are installed.

3.04 TEMPORARY HEATING AND AIR CONDITIONING DURING CONSTRUCTION PHASE

A. Permanent building air conditioning equipment or systems are not designed to control building temperature and humidity levels during construction of the building. The building's HVAC system is not designed nor is it well suited for the proper drying of building/construction materials, and should not be used for such purposes.

B. At all times, during construction phases, provide temporary ventilation both for comfort and protection of workers, for proper drying of wet work, and for proper curing of installed materials. Follow material manufacturer's published instructions with regard to installation of building materials.

C. Provide temporary heat both for the comfort and protection of workers and as necessary to ensure suitable working conditions for construction operations of construction trades, and also as necessary for storage of products and materials. Refer to material manufacturer's literature for environmental operational temperature and humidity requirements.

D. Provide temporary heat by use of self-contained, vented portable heating units, employing tanked gas or other approved heat source.

E. Use only heating apparatus and fuels labeled or listed by a "National Recognized Testing Laboratory" recognized by OSHA. Keep equipment and surroundings in clean, safe conditions.

F. Use flame resistant tarpaulins other material for temporary enclosures of space.

G. Provide temporary humidity control by the use of small incremental de-humidifiers, packaged desiccant type de-humidifiers, and/or packaged DX type air conditioners.

H. Do not permit space temperatures to reach or fall to a level which will cause damage to work. Coordinate the temperature and humidity requirements with the manufacturer of the finishes being provided.

I. Replace interior or exterior surfaces damaged by the use of temporary heaters with new materials or refinish at no additional expense to the owner.

J. As soon as practical after permanent heating, ventilation, and air conditioning systems are in place and operable, the contractor at his option, may provide heat from the permanent building heating system, until such time that the building is complete. It is recommended that the building's permanent heating and air conditioning systems not be utilized to maintain temperature and humidity conditions within the building during the construction phase. Small space heaters and portable de-humidifiers are suggested as sources of temperature and humidity control. It is the intent that the permanent HVAC systems should not be used to condition or control humidity during construction.

K. The use of permanent HVAC systems will require that the systems be complete and fully controllable by the Building Automation System (BAS) including the ability to remotely alarm proper maintenance personnel in the event of any and all system failure(s) or inability to maintain setpoint temperatures and humidity levels. Should the contractor elect to utilize the building's permanent HVAC system, the contractor shall bring the HVAC systems and ductwork back to an original unused condition or state by thoroughly cleaning and/or repairing both equipment and ductwork including repair and refinishing scrapes, tears, scratches and dents, cleaning ductwork, cleaning AHU coils, etc.

L. All dust, dirt, fungal growth, and debris in duct work shall be cleaned.

M. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.

N. Contractor's Use of Permanent HVAC Systems:

1. Heating System:

a. Should the contractor (at his option and at his own risk), utilize the building's permanent heating systems provided under this contract to provide space heating prior to project completion date subject to the restraints stated herein.

b. The fuel for such space heating and for required tests of heating equipment shall be provided by contractor.

c. The start up of equipment for use by the contractor shall not commence any warranty period.

d. The heating system shall be operated only by qualified personnel, and shall be operated with all auxiliaries, safeties, and in accordance with manufacturer's instructions and good operating practice.

e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, contractor will be directed to disconnect its use.

f. Heating systems shall be operated and controlled to prevent temperature in any room or space in any building from exceeding 90 deg. F.

g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork piping, etc., shall not either fall or be elevated above or below normal operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.

h. Systems shall not be operated unattended such as on holidays, weekends, nights, etc, nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The heating system, when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.

i. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air ductwork from accumulating dust or otherwise becoming dirty.

j. Prior to final acceptance of the work, the contractor shall place heating systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.

k. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.

2. Preliminary Heating Test, Adjusting and Balancing Report:

a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:

1) Air pressure drop across the unit filters
2) Air pressure drop across the unit's cooling coil(s)
3) Air pressure drop across the unit's heating coil(s)
4) Total static pressure produced by the unit
5) Discharge air static pressure
6) Fan RPM
7) Suction air pressure
8) Provide a unit pressure graph
9) Discharge air temperature (each air moving device)
10) Return air temperature (each air moving device)
11) Entering water temperatures (hot & chilled)
12) Leaving water temperatures (hot & chilled)
13) Water flow quantity (gpm) through the coil(s)(hot & chilled)

3. Air Conditioning System:

a. Should the contractor (at his option and at his own risk), utilize the building's permanent air conditioning systems provided under this contract to provide space cooling and de-humidification prior to the project completion date. As such, any damages, loss of performance, wear, and other detrimental effects caused by the operational performance characteristics of the A/C system such as condensation, sweating of grilles, registers, diffusers, ducts, equipment, walls, floors, ceilings, and other conditions which may cause damage to building components or which cause mold, mildew, etc., shall be the total responsibility of the contractor.

b. The fuel, electricity or other energy required for space cooling and for any subsequent operation or testing shall be provided by the Contractor.

c. The cooling system(s) shall be operated only by fulling qualified personnel and shall be operated with all safety auxiliaries, and in accordance with manufacturer's instructions and good operating practice.

d. Start-up of equipment for use by the Contractor shall not commence any warranty period.

e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, the contractor will be directed to discontinue and disconnect its use and the contractor will be required to provide portable units to maintain space temperatures.

f. Temporary cooling and/or de-humidification systems shall be operated and controlled to prevent temperature and humidity in any room or space in any portion of the building from falling below 75 deg. F or above 65% relative humidity.

g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork, piping, etc., shall not fall below the normal stated "design" operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.

h. Insulation systems for all piping, ductwork, etc., shall be completely installed prior to use of the permanent systems.

i. Systems shall not be operated unattended such as on holidays, weekends, nights, etc., nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The air conditioning system when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.

j. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air duct work from accumulating dust or otherwise becoming dirty.

k. Contractor shall, prior to final acceptance of the work, place cooling systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.

l. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.

4. Preliminary Air Conditioning Test, Adjusting and Balancing Report:

a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:

1) Air pressure drop across the unit filters
2) Air pressure drop across the unit's cooling coil(s)
3) Air pressure drop across the unit's heating coil(s)
4) Total static pressure produced by the unit
5) Discharge air static pressure
6) Fan RPM
7) Suction air pressure
8) Provide a unit pressure graph
9) Discharge air temperature (each air moving device)
10) Return air temperature (each air moving device)
11) Entering water temperatures (hot & chilled)
12) Leaving water temperatures (hot & chilled)
13) Water flow quantity (gpm) through the coil(s)(hot & chilled)

END OF SECTION 23 00 00

Section 23 05 13 - Common Motor Requirements for HVAC Equipment

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All materials and equipment shall be installed in accordance with Manufacturer's recommended installation methods for obtaining conformance with the Contract Documents.

B. Alignment of all motors, factory coupled or mounted, and all motors field coupled and mounted, shall be rechecked after all connections have been made and after 48 hours of operation in designed service.

C. Verify the voltage characteristics of each motor prior to ordering.

D. Verify the correct wire connections and rotation of equipment by "bumping" motor after wiring.

E. Confirm voltage imbalance on 3-phase motors is less than 2%.

3.2 APPLICATION: Except as specifically indicated, motors shall be selected as follows:

A. Phase:
   1. Less than 1.0 HP: Single-Phase.
   2. 1 HP and Larger: Three-phase.

B. Single Phase Starting:
   1. 1/8 HP and Less: Split phase or permanent split capacitor.
   2. Greater than 1/8 HP: Capacitor start.

C. Enclosure:
   1. Totally enclosed fan-cooled (TEFC) for all motors located outside above roof, in wet areas, in mechanical rooms, or elsewhere as indicated.
   2. Open drip-proof (ODP) for motors located elsewhere, in a clean, dry environment.

END OF SECTION 23 05 13

Section 23 05 53 - Identification for HVAC Piping and Equipment

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment Labels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Manufacturer shall be one of the following:
      a. Brady Corporation.
      b. Brimar Industries, Inc.
      c. Carlton Industries, LP.
      d. Champion America.
      e. Craftmark Pipe Markers.
      f. Emedco.
      g. Kolbi Pipe Marker Co.
      h. LEM Products Inc.
      i. Marking Services, Inc.
      j. Seton Identification Products.
   2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   3. Letter Color: White.
   4. Background Color: Black.
   5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules).

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulated.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

END OF SECTION 23 05 53

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. The Contractor shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s).

B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.

C. Representatives of the Test and Balance Company shall visit the job site during installation of the HVAC equipment, piping and ductwork as required.

D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.

E. The test and balance report complete with a summary page listing all deficiencies shall be submitted to the Architect for review. If the Architect agrees with the report, he shall sign it and return it to the Contractor. The test and balance report must be complete and must be accepted by the Architect prior to acceptance of the project. Any outstanding test and balance items shall be placed on the punch list and a monetary value shall be assigned to them.

F. After all deficiencies have been corrected the Architect shall sign the testing and balancing report, and the Test and Balance Company shall supply four (4) copies of the final and complete report to the Contractor for inclusion in the Operation and Maintenance Manuals.

G. The Test and Balance Company shall obtain a copy of all HVAC related shop drawings from the contractor. The contractor shall provide a set of approved shop drawings to the TAB contractor within 30 days from receiving approved shop drawings.

H. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

1. Air Systems:

a. Exhaust Fans
b. Zone Branch and main ducts
c. Vibration Isolators

2. Duct leakage tests.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

A. Certified TAB reports.

B. Sample report forms.

1.5 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
   1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
   2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine operating safety interlocks and controls on HVAC equipment.

K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:
   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
      b. Duct systems are complete with terminals installed.
      c. Volume, smoke, and fire dampers are open and functional.
      d. Clean filters are installed.
      e. Fans are operating, free of vibration, and rotating in correct direction.
      f. Variable-frequency controllers' startup is complete and safeties are verified.
      g. Automatic temperature-control systems are operational.
      h. Ceilings are installed.
      i. Windows and doors are installed.
      j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. After testing and balancing, install test ports and duct access doors.
   3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure total airflow.
      a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
      b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
   2. Measure fan static pressures as follows:
      a. Measure static pressure directly at the fan outlet or through the flexible connection.
      b. Measure static pressure directly at the fan inlet or through the flexible connection.
      c. Measure static pressure across each component that makes up the air-handling system.
      d. Report artificial loading of filters at the time static pressures are measured.
   3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
   4. Obtain approval from Construction Manager for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
   5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
   1. Measure airflow of submain and branch ducts.
   2. Adjust submain and branch duct volume dampers for specified airflow.
   3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.
   1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
   2. Measure inlets and outlets airflow.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.
   1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
   2. Re-measure and confirm that total airflow is within design.
   3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
   4. Mark all final settings.

5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
   1. Manufacturer's name, model number, and serial number.
   2. Motor horsepower rating.
   3. Motor rpm.
   4. Phase and hertz.
   5. Nameplate and measured voltage, each phase.
   6. Nameplate and measured amperage, each phase.
   7. Starter size and thermal-protection-element rating.
   8. Service factor and frame size.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.8 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

D. Ductwork that initially fails these tests shall be replaced, modified, resealed, etc. as required to meet the leakage requirement and then re-test to ensure compliance.

3.9 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Equipment with Fans: Plus or minus 10 percent.
   2. Exhaust Fans: Plus 10 percent.
   3. Outside Airflow: Plus 10 percent.
   4. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.
2. Motor Data:
    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:
a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

G. Instrument Calibration Reports:
   1. Report Data:
      a. Instrument type and make.
      b. Serial number.
      c. Application.
      d. Dates of use.
      e. Dates of calibration.

3.11 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.

B. Architect may randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:
   1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
   2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
   3. If the second verification also fails, the design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

Section 23 31 13 - Metal Ducts

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Double-wall Spiral ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
1. Adhesives.
2. Sealants and gaskets.

PART 2 - PRODUCTS

2.1 DOUBLE-WALL ROUND DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McGill AirFlow LLC.

2. MKT Metal Manufacturing.
3. Sheet Metal Connectors, Inc.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

   a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

   a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
   b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

D. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.

1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at75 deg F (24 deg C) mean temperature.

2.2 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Duct Galvanized Coating Designation: G90.

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Galvanized sheet metal for rectangular and round ductwork shall have a minimum gauge of 26.

2.3 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers shall be as follows:
   a. Certainteed
   b. Owens Corning
   c. Johns Manville
   d. Knauf

2. Maximum Thermal Conductivity:

   a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

   a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
   3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements as specified for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article."

B. If ducts are not listed in the “Duct Schedule” Article then seal unlisted ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Ducts:
      a. Pressure Class: Positive 2-inch wg.
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 6.
      d. SMACNA Leakage Class for Round and Flat Oval: 3.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than **3-Inch wg**:
        1) Test representative duct sections totaling no less than **25 percent** of total installed duct area for each designated pressure class.
    b. Exhaust Ducts with a Pressure Class of **2-Inch wg or Higher**:
        1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.
    c. Outdoor Air Ducts with a Pressure Class of **2-Inch wg or Higher**:
        1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean [**new**] duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements as specified.

3.10 DUCT SCHEDULE

A. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg.
      b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 6.

END OF SECTION 23 31 13

Section 23 33 00 - Air Duct Accessories

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Manual volume dampers.
   2. Spin Collars.
   3. Flange connectors.
   4. Flexible connectors.
   5. Duct accessory hardware.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G90.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Low-Leakage, Steel, Manual Volume Dampers:
   1. Manufacturers:
      a. Greenheck.
      b. Dace Mfg.
      c. Nailor Industries Inc.
      d. Pottorff.
      e. Ruskin Company.
   2. Comply with AMCA 500-D testing for damper rating.
   3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
   4. Suitable for horizontal or vertical applications.
   5. Frames:
      a. Hat Channel shaped.
      b. 0.031-inch- thick, galvanized sheet steel.
      c. Mitered and welded corners.
      d. Flanges for attaching to walls and flangeless frames for installing in ducts.
   6. Blades:
      a. Multiple blade.
      b. Opposed-blade design.
      c. Stiffen damper blades for stability.
      d. Galvanized, roll-formed steel, 0.031 inch thick.
   7. Blade Axles: Galvanized steel.
   8. Bearings:
      a. Molded synthetic.
      b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
   9. Blade Seals: Neoprene.
   10. Jamb Seals: Stainless Steel.
   11. Tie Bars and Brackets: Galvanized steel.
   12. Accessories:
      a. Include locking device to hold single-blade dampers in a fixed position without vibration.

B. Jackshaft:
   1. Size: 0.5-inch diameter.
   2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
   3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:
   1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
   2. Include center hole to suit damper operating-rod size.
   3. Include elevated platform for insulated duct mounting.

2.4 SPIN COLLARS

A. All round take-offs to round branch duct shall be made with factory fabricated spin-type collar fittings with balancing damper and constructed of minimum 26 ga galvanized steel. The damper shall have a raised 2" handle with a high quality locking quadrant. A 3/8" continuous rod with “U” bolts connects the damper to the rod. Nylon end bearing are required where the rod penetrates the spin collar barrel. These spin-collars shall be as manufactured by Flexmaster Model FLD-B03, Dace #26ga MSD-C03 or approved equal.

2.5 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd.
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd..
   2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F.

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
   1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
   2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
   7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.6 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.
   2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. Upstream from duct filters.
   2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
   3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
   4. At each change in direction and at maximum 50-foot spacing.
   5. Control devices requiring inspection.
   6. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:
   1. One-Hand or Inspection Access: 8 by 5 inches.
   2. Two-Hand Access: 12 by 6 inches.
   3. Head and Hand Access: 18 by 10 inches.
   4. Head and Shoulders Access: 21 by 14 inches.
   5. Body Access: 25 by 14 inches.
   6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

Q. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.
   5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

Section 23 34 23 - HVAC Power Ventilators

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Inline exhaust fans.
   2. Wall propeller fans.

1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Roof curbs.
   7. Fan speed controllers.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 WELDING EXHAUST FANS

A. Manufacturers:
   1. Lincoln

B. Centrifugal belt drive fans shall be provided with up-blast discharge arrangement. Refer to schedule on drawings for capacities.

C. Backward inclined wheel shall have welded blades, single thickness. Fan wheels shall be dynamically balanced. All fans shall be test run at the factory before shipping. Shafts shall be turned, ground, and polished.

D. Housings shall be heavy duty 10 gauge steel, continuously welded and supported to prevent housing pulsation at all conditions. V-belt selection shall be a minimum of 1.3 times normal horsepower. All bearings shall be heavy-duty, lubricated, self-aligning ball bearings.

E. Motors shall be tefc suitable for operating in outdoor conditions.

F. All parts in contact with the airstreem shall be standard steel construction.

G. Fan shall be complete with belt guard, vented motor weatherhood, inlet flange, rubber-in-shear vibration isolation base, drain connection, extended lube lines, and flexible connections on inlet and outlet of fan.

H. Before painting, all steel shall be cleaned by detergent wash, phosphated and painted with baked enamel or baked powder finish.

I. Fan shall have VFD controller provided by fan manufacturer.

2.2 WALL PROPELLER FANS

A. Manufacturers:
   1. Cook.
   2. Greenheck.
   3. ACME
   4. Pen-Barry
   5. Twin City

B. Installation of the fan shall include miscellaneous or structural metal supports, field electrical wiring, cable, conduit, fuses, disconnect switches, etc.

C. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

D. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

E. Fan Wheel: Replaceable, aluminum, airfoil blades fastened to steel hub; factory set pitch angle of blades.

F. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

G. Fan Drive:

1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

    a. Ball-Bearing Rating Life: ABMA 9, L_{10} of 100,000 hours.

8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

H. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.
5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

I. Capacities and Characteristics: See Mechanical Schedules.

J. Retain "Belt Drives" Paragraph below if belt-driven fans are required; delete if only direct-drive fans are required.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Install units with clearances for service and maintenance.

C. Label units according to requirements specified.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION 23 34 23

Section 26 05 00 – Common Work Results for Electrical

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Touchup painting.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections with buildings and grounds.

D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

F. Coordinate connecting to all equipment with equipment provider. This includes mechanical, plumbing, owner provided and contractor provided equipment. Contractor to refer to equipment installation documents prior to any rough-in.

G. Contractor shall not penetrate any stair wall assemble with conduit, boxes, cabling and the like, except for items that serve the stairwell.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

H. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 TOUCH-UP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 FIRESTOPPING AND FIRE RATED WALLS/CEILINGS/FLOORS

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.6 REFINISHING AND TOUCH-UP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

B. Conductor Material: Copper; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

C. Conductor Insulation Types: Type THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway .

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Fire Alarm Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.

I. Low Voltage Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.

J. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.

3.2 INSTALLATION

A. Conceal cables in conduit in finished walls, unaccessible ceilings, and floors.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Support cables according to Section "Basic Electrical Materials and Methods."

E. Identify and color-code conductors and cables according to Section "Electrical Identification."

F. Use #10 AWG conductors for 20 amperage 120 circuits when the circuit conductors are longer than 75 feet. Use #10 AWG conductors for 20 amperage 277 circuits when the circuit conductors are longer than 200 feet.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

1. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

END OF SECTION 26 05 19

Section 26 05 26 – Grounding and Bonding for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.
   1. Underground grounding.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
   1. No. 4 AWG minimum, soft-drawn copper.
   2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches by 24” minimum in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

D. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Manhole Grounds: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

Section 26 05 29 – Hangers and Supports for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.
   g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs

shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps / single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC RMC EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

Section 26 05 33 – Raceways and Boxes for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Refer to architectural for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
2. "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
3. "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, floor boxes, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70-Latest edition or edition enforced by state and local code authority.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL WIREWAYS

A. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.2 NONMETALLIC WIREWAYS

A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and two coats of paint. Color by Architect.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

B. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

C. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

D. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.5 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.6 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Aluminum Rigid Conduit: ANSI C80.5.

C. IMC: ANSI C80.6.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C 80.3.

G. EMT and Fittings: ANSI C80.3.

H. FMC: Aluminum

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 4.

B. Indoors:

1. Exposed: EMT in non finished areas. Surface metal raceway in existing finished unaccessible areas unless noted otherwise.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations above Ground: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21) below grade and ½ inch trade size above grade.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover. Conduits larger than 1” shall not be installed in the slab.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

Q. Set floor boxes level and flush with finished floor surface.

R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

Section 26 05 53 – Identification for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Warning labels and signs.
3. Instruction signs.
4. Equipment identification labels.
5. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes and standards. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

1. Exterior Concrete Unit Masonry:
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
      1) Block Filler: Concrete unit masonry block filler.
      2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Ferrous Metal:
   a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Exterior ferrous-metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

3. Exterior Zinc-Coated Metal (except Raceways):
      1) Primer: Exterior zinc-coated metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

4. Interior Ferrous Metal:
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Interior ferrous-metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

5. Interior Zinc-Coated Metal (except Raceways):
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Interior zinc-coated metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    a. Power transfer switches.
    b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

E. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:
    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Emergency system boxes and enclosures.
    f. Receptacles with panel and circuit numbers.
    g. Disconnect switches.
    h. Enclosed circuit breakers.
    i. Power transfer equipment.
    j. Contactors.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service feeder branch-circuit service, feeder, and branch-circuit conductors.

1. Color shall be factory applied factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
3. Colors for 480/277-V Circuits:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

END OF SECTION 26 05 53

Section 26 24 16 - Panelboards

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
3. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Architect's written permission.
3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.
    c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
    d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

    a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.

G. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

    a. Plating shall run entire length of bus.
    b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Split Bus: Vertical buses divided into individual vertical sections.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.

4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: As per schedule

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on electronic circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated on the schedules.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long and short time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."
h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
i. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
j. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
k. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
l. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
2. Fused Switch Features and Accessories:

a. Standard ampere ratings and number of poles.
b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407.

D. Equipment Mounting:

1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."

2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
3. Comply with requirements for seismic control devices specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

K. Install filler plates in unused spaces.

L. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

N. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73.16 "Coordination Studies."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.

2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

Section 26 27 26 – Wiring Devices

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters and isolated-ground receptacles.
2. Single- and double-pole snap switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Receptacles, switches, plates, floor outlets, poke through assemblies, service poles and multioutlet assemblies.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 latest edition or edition enforced by state or local code authority.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Outlets - Duplex:
   a. Hubbell Incorporated- HBL 5362.
   b. Leviton Mfg. Company Inc.-5362.
   c. Pass & Seymour-CRB5362.
   d. Pass & Seymour -PT5362A (Plug Tail Device).

2. Switches-Single Pole:
   a. Hubbell- HBL 1221.
   b. Pass & Seymour - PS20AC1.
   c. Leviton Mfg. Company, Inc.- 1221-1

3. Switches-Three Pole:
   a. Hubbell- HBL1223
   b. Leviton Mfg. Company, Inc.-1223-2.
   c. Pass & Seymour-PS20AC3.

4. Dimmer Switches Line Voltage:
   a. Lutron Nova T
   b. Pass & Seymour CD2000

* Dimmer must be compatible with Ballast or LED Driver.

5. Dimmer Switches 0-10V:
   a. Synergy ISD
   b. Cooper SF10P

* Dimmer must be compatible with Ballast or LED Driver.

6. GFI Receptacles: Weather Resistant:
   a. Hubbell Incorporated- BR20WR
   b. Leviton Mfg. Company Inc.-WBR20
   c. Pass & Seymour- WR5362.

7. GFI Receptacles: Weather Resistant and Tamper Resistant:
   a. Hubbell Incorporated- BR2WRTR.
   b. Leviton Mfg. Company Inc.-TWR20
   c. Pass & Seymour- WR20TR.

8. Receptacles: Tamper Resistant:
   a. Hubbell Incorporated- BR20TR.
   b. Leviton Mfg. Company Inc.-TWR20
   c. Pass & Seymour- TR5362.

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with UL 498, 20 amp.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade 20 amp.

C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Single- and Double-Pole Switches: Comply with UL 20, 20 amp.

B. Snap Switches: Heavy-Duty grade, quiet type 20 amp, 120/277 volt.

C. Live Voltage Dimmer: 120V, 2000 watt, slide to-off. Dimmer must be compatible with ballast or driver.

D. 0-10V Dimmer: 120/277VAC, capable of three way, max wattage 1200 w 120VAC, 150000 277 VAC, Dimmer must be compatible with ballast or driver. 100% to 1% continuous.

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: **As selected by Architect**.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

C. Remove wall plates and protect devices and assemblies during painting.

D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

E. Install weather resistant receptacles in damp and wet locations per N.E.C. requirements.

3.2 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

Section 26 28 13 – Fuses

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Fuse size for elevator feeders and elevator disconnect switches.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ferraz Shawmut, Inc.
2. Little Fuse.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

B. End Caps: End caps shall be capable of being tested if fuse is blown.

C. Indicating Feature: Fuse shall have an indicating feature which clearly indicates when fuse is blown.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

Section 26 28 16 – Enclosed Switches and Circuit Breakers

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:

1. Feeder and branch-circuit protection.
2. Motor and equipment disconnecting means.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switch and circuit breaker.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Current and voltage ratings.
c. Short-circuit current rating.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Fusible Switches:

a. Eaton Corp.; Cutler-Hammer Products, K-Series.
b. General Electric Co.; Electrical Distribution & Control Division, TH.
c. Siemens Energy & Automation, Inc., VBII.
d. Square D Co, 3110.

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in "Basic Electrical Materials and Methods."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. If the disconnect or enclosed circuit breaker is used as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maxiumum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

3.3 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

D. Maintain all necessary clearances per NFPA-70.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16

Section 26 51 00 – Interior Lighting

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 REFERENCES

A. ANSI/NFPA 70, National Electrical Code

B. IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits

C. FCC 47 CFR Part 15, Federal Code Of Regulation (CFR) testing standard for electronic equipment

D. IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products

E. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources

F. UL1598, Standard for Safety of Luminaires

G. NEMA SSL 3-2010, High-Power White LED Binning for General Illumination

1.3 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
4. Emergency lighting unit battery and charger.
5. Fluorescent and high-intensity-discharge ballasts.
6. Types of lamps.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.

1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

C. Submit product data on luminaires. Product data to include, but not limited to materials, finishes, approvals, photometric performance, and dimensional information.

D. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in the front end documents.

1.5 DRAWINGS

A. The drawings, which constitute a part of these specifications, indicate the general location of the luminaires. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.

B. Photometric layout shall meet or exceed the criteria of the fixtures indicated on drawings.

1.6 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

D. LED Luminaires

1. Manufactures of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.
2. The use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.
3. At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRI. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.
4. Luminaires shall be provided with a 5 year warranty covering, LEDs, drivers, paint and mechanical component.

1.7 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.8 WARRANTY

A. General Warranty: The contractor shall warranty all work for one year after acceptance of project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Fixture schedule on the drawings. Manufacture shall submit for prior approval where required at least (10) days prior to bid.

B. Subject to compliance with these specifications, luminaires shall be as manufactured by manufacture indicated on the drawings or prior approved equivalent.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

2.3 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:

1. Designed for type and quantity of lamps indicated at full light output.
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Sound Rating: A.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:

1. Encapsulation: Without voids in potting compound.
2. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail. Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surving lamps if one or more lamps fail.
3. Operating Frequency: Ballast shall be high frequency electronic type and operate lamps at a frequency between 42 kHz and 52 kHz to avoid interference with infrared devices and eliminate visible flicker.
4. Ballast shall provide Independent Lamp Operation (ILO) for Programmed Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail. Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
5. Ballast shall operate from 60 Hz input source of 120V through 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency).
6. Ballast starting voltage shall be equal to or greater than 550v.

C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:

1. Type: Electronic or electromagnetic, fully encapsulated in potting compound.
2. Power Factor: 90 percent, minimum.

3. Operating Frequency: 20 kHz or higher. 42 kHz or higher.
4. Flicker: Less than 5 percent.
5. Lamp Current Crest Factor: Less than 1.7.

2.4 EXIT SIGNS

A. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.5 LAMPS

A. Fluorescent Color Temperature and Minimum Color-Rendering Index: Refer to drawings.

B. 4 foot lamps shall be 28 watt, 68,000 rated life 12 hour on with instant start ballast and 90,000 12 hour on with programmable start. Initial lumens 2650, minimum CRI of 82 and a 96% lumen maintenance. Approved lamp is Philips Energy Advantage.

C. All fluorescent lamps shall be low mercury.

2.6 LED LUMINAIRES

A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Material and specifications for each luminaire are as follows:
1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply)
2. Each luminaire shall be rated for a minimum operational life of 50,000 hours and to LM-70 lumen depreciation standards. This life rating must be conducted 40C ambient temperature.
3. The rated operating temperature range shall be -30°C to +40°C.
4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
7. Luminare shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.

C. Technical Requirements
1. Electrical
a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
b. Operation Voltage: The luminaire shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.

e. Each Luminaire shall have UL Listed Class II power supplies. Class I power supplies will not be acceptable.
f. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
g. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
h. Drivers shall have a Class A sound rating

2. Thermal Management
a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
e. The heat sink material shall be aluminum

2.7 FIXTURE SUPPORT COMPONENTS

A. Comply with "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.

C. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

D. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.8 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.

2. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Provide instruments to make and record test results.

C. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to emergency source and retransfer to normal.
4. Report results in writing.

D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

E. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 26 51 00

SECTION 31 23 00 – EXCAVATION AND FILL
(Reference Civil Documents for Specific Application)

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:
- A. Informational reference to site survey and to subsurface conditions: Conditions of the Contract.
- B. Field engineering for site layout: Section 01 71 23
- C. Testing laboratory services: Section 01 45 29 (Testing and Laboratory under Separate Contract with Owner.)
- D. Temporary controls for site work: Section 01 50 00
- E. Cast-In-Place concrete: Section 03 30 00

1.2 REFERENCES:
- A. ASTM D 698, Moisture-Density Relationship of Soils and Soil Aggregate Mixture Using 5.5-lb. Rammer and 12-in. Drop.
- B. ASTM D 2487, Classification of Soils for Engineering Purposes.
- C. ASTM D 2922, Density of Soil in Place by Nuclear Method.
- D. SDHPT, Standard Specifications for Construction of Highways, Streets, and Bridges.

1.3 QUALITY ASSURANCE:
- A. Testing laboratory will obtain samples of borrow from source; place borrow material only after test results have been reviewed and approved by Architect.
- B. Site Information:
  1. Data on indicated site survey and subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings and elevation locations. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for convenience of Contractor.

1.4 GRADES:
- A. Carefully compare new grade requirements with existing conditions.
- B. Provide necessary earth, grading and shaping work.
- C. Extra payment will not be authorized for overage or shortage of material.

1.5 USE OF EXPLOSIVES: Use of explosives is not permitted on this Project.

PART 2 – PRODUCTS

2.1 SELECT FILL
- A. Non-active sandy clay or clayey sand type substance, having a Liquid Limit of 36 or less and Plasticity Index (P.I.) varying from 10 to 20, as acceptable to testing laboratory.

2.2 SAND FILL: Bank run sand, with 100% passing No. 200 sieve.

2.3 BACKFILL MATERIAL:
- A. Borrow material which is free from rocks larger than 3 inches in size, alkali, salt, petroleum products, debris, waste, roots, vegetable and other deleterious matter.
- B. Excess non-vegetated excavated soils available from site may be used if conforming to specified requirements.

2.4 TOPSOIL:
- A. Friable sandy-clay loam free from subsoil, roots, grass weeds, stones and foreign matter; acidity range (PHK) of 6.0 to 6.5. (Use topsoil stockpiled on site if conforming to these requirements.)

B. Compositions: 7 to 27 percent clay particles, 28 to 50 percent silt particles, less than 52 percent sand particles, measured by volume.

PART 3 – EXECUTION

3.1 STRIPPING:
A. Strip entire area to receive pavement and slabs on grade to a minimum depth as noted on Civil drawings to remove soil containing vegetated material.
B. Remove vegetated material from site as waste.
C. Remove topsoil; spread on areas already graded and prepared for topsoil, or deposit in storage piles convenient to areas subsequently to receive topsoil.
D. Remove existing site improvements in areas scheduled to receive lawns, buildings, and pavements.
E. Stripped material becomes property of Contractor; remove from project site immediately and dispose of properly, unless meeting topsoil of select fill specification. Maintain site surface drainage during stripping.

3.2 EXCAVATION FOR FOUNDATIONS:
A. Excavate to depth required. Reference structural plans.
B. Excavate below indicated depths only when authorized by Architect.
C. Fill unauthorized excavation below bottom of indicated elevations with compacted select fill at no additional cost to Owner.
D. Maintain excavations free of loose earth and debris.
E. Approved excavated sub-soils may be stockpiled for use in backfilling of perimeter foundations.
F. Protect open excavations with coverings as necessary to maintain optimum soil moisture content.

3.3 EXCAVATION FOR UTILITY TRENCHES:
A. Excavate using ladder-type trenching machine or backhoe unless indicated otherwise.
B. Cut trench sides vertical from trench bottom to one foot above top of pipe; slope back on stable slope above that point.
C. Extend trench width minimum 6 inches and maximum 18 inches each side of pipe.
D. Approved trench shoring is acceptable in lieu of sloping sides of trench.

3.4 DEWATERING:
A. Keep excavations dry; maintain dewatered conditions for depth of one foot below excavation bottom.
B. Operate suitable pumps necessary to keep excavations continuously free of water.
C. Discharge drainage water lines into approved sewers only with appropriate approvals; use of sanitary sewer is prohibited.
D. Direct surface drainage away from excavated areas.
E. Control grading adjacent to excavations to prevent water running into excavated areas or onto adjacent property.

3.5 MOISTURE CONTROL:
A. Where material must be moisture conditioned before compaction, uniformly apply water to surface of layer of material; prevent free water appearing on surface during or subsequent to compaction operations.
B. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
C. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.6 MACHINE DRILLED FOOTING EXCAVATION:
A. All drilled footing excavation shall be under the inspection of a qualified testing laboratory and in compliance with the recommendations of the published soil investigation report enclosed in this project manual.

B. Excavate with suitable power drilling and under-reaming equipment operated by workmen experienced and skilled in this operation.
C. Commence operation when reinforcing steel is assembled and ready to be placed; coordinate with Division 3 requirements.
D. Drill shafts vertically; belled bases of diameters and depths as indicated.
E. Footing excavations is subject to adjustment of bearing elevation plus or minus 12 inches from that indicated.
F. Provide casings to suit conditions and requirements.
G. Steel casings so provided may be withdrawn as concrete is placed, at Contractor's option.
H. Maintain excavations free of spilled and loose earth until concrete is in place.
I. Fill with concrete immediately after excavation; coordinate with Division 3 requirements.

3.7 FILL WITHIN PERIMETER OF BUILDINGS (Under Floor Slabs):
A. All fill material placed under the slab shall be under the inspection of a qualified testing laboratory and in compliance with the recommendations of the published soil investigation report enclosed in this project manual.
B. Place select fill in lifts not to exceed 8 inches in loose thickness. (4 inch lifts for handheld tamping equipment.)
C. Compact to not less than 95% maximum density in accordance with ASTM D 698 as confirmed by testing laboratory; maintain moisture content within +/- 2% of optimum; check field densities in accordance with ASTM D 2922.
D. Where fill is less than 6 inches, scarify ground to a depth of 6 inches and compact as specified above.

3.8 PERIMETER BACKFILL (Embankment):
A. Backfill exterior side of perimeter of structures with approved back fill materials, carrying such fill up to rough grade elevations.
B. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
C. Commence backfilling after underground work has been inspected, tested, forms removed, and excavation cleaned of trash and debris.
D. Place and compact backfill to minimize settlement and avoid damages to work in place.
E. Place backfill simultaneously on both sides of free-standing structures; prevent wedging action against structure.
F. Place materials in successive horizontal layers of not more than 8 inches (4 inches for handheld tamping equipment).
G. Compact to not less than 93 to 95% maximum density in accordance with ASTM D 698, as confirmed by testing laboratory; maintain moisture content for compacted material within +/- 2% of optimum; check field densities in accordance with ASTM D 2922.

3.9 UTILITY TRENCH BACKFILL:
A. Backfill trench as soon as possible after pipe has been laid, jointed and inspected; complete backfilling at end of each day.
B. Within Pipe Zone: Place backfill material and hand tamp in 6 inch layers to one foot above top of pipe.
C. Above Pipe Zone: Place backfill and compact in 12 inch layers to within 12 inches of surface.
D. Within 12 inches from surface, place and tamp backfill to density of surrounding natural soil.
E. For trenches under existing or new paved surfaces, or under unpaved road ways, shoulders, or driveways, backfill trench with cement stabilized sand.
F. Place cement-stabilized sand in trenches to within 12 inches of the finished surface.
G. Use cement-sand material as backfill material around manholes if the structure adjoins pavement.
H. Where trenches are raked in preparation for future sod, adjust surface to match existing grades.
I. Place cement-sand material at optimum moisture content in layers not to exceed 12 inches, measured loose.

J. Compact to not less than 93 to 95% maximum density in accordance with ASTM D 698, as confirmed by testing laboratory; maintain moisture content for compacted material within +/- 2% of optimum; check field densities in accordance with ASTM D 2922.

3.10 PREPARATION OF SUBGRADE FOR PAVING, WALKS, AND EXTERIOR SLABS:

A. Cut and fill areas as required.
B. Proof roll subgrade with heavy roller; cut out any soft area that cannot be compacted by surface rolling and replace with compacted select fill.
C. Provide select fill at areas where required to elevate subgrade. (Embankment.)
D. Compact to not less than 93 to 95% maximum density in accordance with ASTM D 698, as confirmed by testing laboratory; maintain moisture content for compacted material with +/- 2% of optimum; check field densities in accordance with ASTM D 2922.
E. Maintain site surface drainage during construction.

3.11 ROUGH GRADING:

A. Cut out areas to subgrade elevation which is to receive paving and walks.
B. Shape subgrade to allow for maximum amount of natural settlement and compaction.
C. Remove debris, roots, branches, stones, in excess of 2 inches in size.
D. Remove subsoil which has been contaminated with petroleum products.
E. Excavate areas, to subgrade elevation, which are to receive paving and sidewalks.
F. Bring subgrade to required levels, profiles and contours, making gradual changes in grade; blend slopes into level areas.
G. Slope grade away from building minimum 2 inches in 10 feet unless indicated otherwise.
H. Cultivate subgrade to a depth of 3 inches where topsoil is to be placed repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subgrade.
I. Maintain site surface drainage during construction.

3.12 FINISH GRADING:

A. Place minimum 4 inches topsoil in to a grade one inch below top of concrete areas where sodding is to be performed.
B. Use topsoil in relatively dry state; place during dry weather.
C. Fine grade topsoil eliminating rough and low areas to create positive drainage.
D. Maintain levels, profiles and contours of subgrades.
E. Remove stone, roots, grass, weeds, debris and other foreign material while spreading.
F. Manually spread topsoil around trees, plants and building to prevent damage caused by grading equipment.
G. Lightly compact placed topsoil.

3.13 SURPLUS MATERIALS:

A. Remove surplus subsoil from site.
B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

3.14 CLEAN-UP:

A. Remove temporary structures, rubbish, and waste materials from work site daily.

END OF SECTION

SECTION 31 31 16 – TERMITE CONTROL

PART 1 – GENERAL

1.1 SCOPE: Provide termite control work for new concrete foundations only.

1.2 RELATED WORK SPECIFIED ELSEWHERE:
- A. Submittal procedures: Section 01340.
- B. Cast-in-place concrete: Section 03300.

1.3 SUBMITTALS:
- A. Product Data: Manufacturer's technical data and application instructions.
- B. Certificates: Manufacturer's certification that products are in compliance with current environmental protection statutes.

PART 2 – PRODUCTS

2.1 SOIL TREATMENT SOLUTION: (Verify federal, state and local acceptance of application)
- A. Type: Emulsible concentrated insecticide for dilution with water specially formulated to prevent termite infestation.
- B. Acceptable Termiticides:
  1. Termidor 80WG (fipronil) with Agreszor 75WSP (imidacloprid).
- C. Dilute only as recommended by manufacturer.
- D. Other solutions may be used as recommended by certified and licensed applicator.
- E. Use only soil treatment solutions that are not harmful to plants.

PART 3 – EXECUTION

3.1 SOLUTION APPLICATION AT BUILDING SLAB ONLY:
- A. Apply termite control solution according to current EPA regulations.
- B. Add chemically inert coloring agent to solution to indicate which areas have received treatment.
- C. Apply to inside of foundation walls, along both sides of interior partition walls, and around plumbing penetrations.
- D. Apply solution as overall treatment under interior slab and attached slab areas.
- E. Apply solution along outside edge new and existing building, 3 inches above grade.
- F. Allow minimum 12 hours for drying after application, before beginning concrete placement and other construction activities.
- G. Post signs in areas of application with warning that soil poisoning have been applied.
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation or back-filling when completing finished grading and other construction activities following application.
- I. Provide certification that application has been applied as specified and after completion of backfilling against slabs.

END OF SECTION

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END OF SECTION

SECTION 32 13 13 – CONCRETE PAVING
(Reference Civil Documents for Specifics)

PART 1 – GENERAL

1.1 SUBMITTALS: Submit the following:
- A. Product data for reinforcement, accessories, admixtures, joint systems, curing compounds, and dry-shake color materials.
- B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Laboratory test reports for evaluation of concrete materials and mix design tests.

1.2 QUALITY ASSURANCE: Comply with provisions of ACI 301, "Specifications for Structural Concrete for Buildings," ACI 318, "Building Code Requirements for Reinforced Concrete," and CRSI "Manual of Standard Practice," except where more stringent requirements are indicated.
- A. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- B. Concrete Testing Service: Reference Section 01 45 29 – Testing Laboratory Services Provided by Owner Under Separate Contract.

PART 2 – PRODUCTS

2.1 Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type Materials to provide full depth, continuous, straight, smooth exposed surfaces.
- A. Use flexible or curved forms for curves of a 100 foot or less radius.

2.2 Reinforcing Materials: As follows:
- A. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.
- B. Welded Steel Wire Fabric: ASTM A 185, flat sheets, not rolls.

2.3 Concrete Materials: As follows:
- A. Portland Cement: ASTM C 150, Type 1
- B. Aggregates: ASTM C 33, Class 4, except aggregates of proven durability may be used when acceptable to Architect.
- C. Water: Potable
- D. Fiber Reinforcement: ASTM C 1116, Type III

2.4 Admixtures: Provide admixtures that are compatible with one another and do not contain more than 0.1 percent chloride ions.
- A. Air-Entraining Admixture: ASTM C 260
- B. Water-Reducing Admixture: ASTM C 494, Type A
- C. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
- D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- F. Fly Ash not to exceed 20% by weight

2.5 Curing Materials: As follows:
- A. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss. (Exterior)
- B. Moisture-Retaining Cover: Waterproof paper, polyethylene film, or white burlap-polyethylene sheet complying with ASTM C 171. (Building Slab)
- C. Clear Waterborne Membrane Forming Curing Compound: ASTM C 309, Type I,
  1. Class B. (Exterior)

D. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.

2.6 Related Materials: As Follows:
A. Traffic Paint: Alkyd-resin ready-mixed, complying with AASHTO M 248, Type S. Color Yellow.

2.7 Mix Design: Comply with mix design procedures specified in ACI 301 and proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
A. Compressive Strength: 3000 psi at 28 days except for grade beams and footings may be minimum 2500 psi at 28 days.
B. Fly Ash: 15 % by weight max.
C. Water-Cement Ratio: 0.45 maximum at point of placement.
D. Slump Limit: 3 inches at point of placement.
E. Air Content: 2.4 to 4.5 percent. No air entrainment allowed in building slab concrete.

2.8 Ready-Mixed Concrete: Comply with requirements and ASTM C 94.

PART 3 – EXECUTION

3.1 Surface Preparation:
A. Proof-roll prepared subgrade and remove loose material from surface.

3.2 Forms: Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations.

3.3 Reinforcement: Accurately position and support reinforcement, and secure against displacement. Set wire ties with ends directed into concrete.
A. Install welded wire fabric in lengths as long as practicable; lap at least one full mesh and lace splices with wire.

3.4 Joints: Locate and install contraction, construction, isolation, and expansion joints as indicated or required.

3.5 Concrete Placement: Comply with ACI 304 for measuring, mixing, transporting, and placing concrete. Place concrete in a continuous operation within planned joints or sections.
A. Moisten sublease when required to provide a uniform dampened condition at time concrete is placed.
B. Consolidate placed concrete according to ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping.
C. Screed and darby or bull-float the surface before excess moisture or bleed water appears on the surface.
D. Protect concrete from cold or hot weather during mixing, placing, and curing as follows.
1. In cold weather, comply with ACI 306R
2. In hot weather, comply with ACI 305 R

3.6 Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. float surfaces to true planes within a tolerance of 1/4 inch in 100 feet as determined by a 10 foot long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
A. Medium to Fine Textured Broom Finish: Draw a soft bristle broom across concrete surface, perpendicular to line of traffic, to provide a uniform fine line texture.

3.7 Final Tooling: Tool edges and joints formed in fresh concrete with a jointing tool to a radius of 3/8 inch. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.8 Protection: In hot, dry and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control film. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

3.9 Curing: Begin curing after finishing converter but not before free water has disappeared from exposed surfaces.

A. Moisture-cure concrete by water ponding, continuous fog spraying, continuously wetted absorptive cover, or by moisture-retaining cover curing. Keep concrete continuously moist for not less than 7 days.
B. Apply membrane-forming curing compound to concrete as soon as final finishing operations are complete. Apply uniformly according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 Traffic Paint; Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide a 15 mil minimum wet film thickness.

3.11 Field Quality Control: Employ a qualified independent testing and inspection agency to sample concrete, perform tests, and submit test reports during concrete placement as follows:

A. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's placement of each type of concrete Additional tests will be required when concrete consistency changes.
B. Air-Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's placement of each type of air-entrained concrete.
C. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
D. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive strength test, unless directed otherwise. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are required.
E. Compressive Strength Tests: ASTM C 39, one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.

3.12 When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

3.13 When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.

3.14 When strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

3.15 Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

3.16 Test results will be reported in writing to Architect, ready-mix manufacturer and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the project

identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 day and 28 day tests.

3.17 Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

3.18 Additional Tests: The testing agency will make additional tests of concrete when test results indicate slump, air entrainment, concrete strengths, or other characteristics have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM 42, or by other methods as directed.

3.19 Remove and replace concrete paving that is broken, damaged, or defective, and does not meet the requirements of this Section.

3.20 Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement.

3.21 Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION